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<p>(54) Title: WRINKLE RESISTANT COMPOSITION</p>		
<p>(57) Abstract</p> <p>There is provided a composition as well as a method for treating fabrics in order to improve various properties of fabrics, in particular, wrinkle resistance by means of a cross-linking resin having cationic properties.</p>		

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Wrinkle resistant composition

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Technical field of the invention

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The present invention relates to fabric care compositions and to a method for treating fabrics in order to improve various properties of fabrics, in particular, wrinkle resistance.

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Background of the invention

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The domestic treatment of fabric is a problem known in the art to the formulator of laundry compositions. Hence, it is well known that alternating cycles of using and laundering fabrics and textiles, such as articles of worn clothing and apparel, will inevitably adversely affect the appearance and integrity of the fabric and textile items so used and laundered. Fabrics and textiles simply wear out over time and with use. Laundering of fabrics and textiles is necessary to remove soils and stains which accumulate therein and thereon during ordinary use. However, the laundering operation itself, over many cycles, can accentuate and contribute to the deterioration of the integrity and the appearance of such fabrics and textiles.

35

One solution for improving the appearance and integrity of the fabric can be found in WO98/04772 which provides the treatment of fabric against fabric creasing by application of a composition comprising a polycarboxylic acid or derivative thereof; and then curing the composition using a domestic process.

- 5 However, it has been found that, although effective in reducing creasing, the compounds described in this patent still do not effectively bind the cellulosic fibers in rinse application.

- 10 Accordingly, it is an object of the invention to provide compound and compositions thereof which provide effective deposition on the fabric without being detrimental to the appearance and integrity of the fabric. In particular, it is an object of the invention to provide compound or compositions having effective durable press properties.

- 15 The durable press problem in industrial field is known in the art. Processes for the industrial durable press treatment of textile fabrics were first introduced in the 1960's and have achieved widespread use since that time. These durable press treatment processes typically involve treating the fibers of the textile fabrics with cross-linking agents. Early durable press processes used formaldehyde as a
20 cross-linking agent which, although effective, was highly odorous and undesirable to the consumer.

- As a consequence, formaldehyde was replaced by reactive resins such as dimethylol urea (DMU), dimethylol ethylene urea (DMEU), and by modified
25 ethylene urea resins, such as dimethylol dihydroxy ethylene urea (DMDHEU). However, still it is known that the desired increases in the durable press performance through the use of cross-linking agents are sometimes accompanied by undesirable losses in other important fabric properties, such as tensile strength, tear strength, abrasion resistance and fabric hand.

- 30 Further, solutions obtained from industry are not usually transposable to domestic treatments. Indeed, in industrial processes a strict control over parameters such as pH, electrolyte concentration, water hardness, temperature, etc., is possible whereas in a domestic washing machine, such a high level of
35 control is not possible.

Moreover, it has been found that solutions from industry do not effectively bind the cellulosic fibers in domestic rinse application.

- Domestic durable press treatments require conditions that industrial treatment do not have to fulfill. Hence, for domestic durable treatments, the compounds or compositions thereof need to manifest at least one of the following properties:

i)-provide a low level of aldehyde; indeed aldehyde based cross-linker technologies are less favoured in domestic process from an environmental and safety standpoint because contrary to industry where the process is controlled, in domestic process the consumer is the only person using the product, thus enabling the possibility of misuse. Further, high levels of aldehyde tends to produce an odour which would deter the consumer from using it again. Thus, it is desired to provide durable processes for use in domestic process which are safe to the consumer and provide a good odour acceptance.

ii)-provide a low or even no tensile strength loss; again as stated above for i), the control of the process in domestic treatment is less measurable. Further, contrary to industry where the fabrics are treated once, domestic treatment involves repeated usage and thus produce a tensile strength loss. Thus, it is desired to provide durable processes for use in domestic process which provide a low or even no tensile strength loss.

iii)-be usable at low temperature; indeed in a domestic process, and in particular in a domestic rinse process, it is not practical to rely on high treatment temperatures such as those used in industrial processes, that is of above 40°C. Thus, it is also a further desire of domestic durable press to provide a better performance at these low temperatures; indeed industry usually achieves a better performance by close control of the reaction process and its various parameters involved. In domestic treatment, however, this close control cannot be achieved. Thus, the performance of the durable press process needs mostly to be achieved by use of efficient technology.

iv)-be applicable in rinse applications: in such type of application, easier control of the use of the product is achieved, thereby avoiding misuse. Thus, for

domestic treatment, the technology involved in the durable press process needs preferably to be suitable for use in rinse application.

and/or

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vi)-not provide stiffness to fabrics. Again, as described for ii), the repeated usage that are involved in domestic treatment may also lead to stiff fabric. Accordingly, it is desired to provide durable press process which reduces such negative.

- 10 In addition to the above, industrial processes use high concentrations of cross-linking agents which is required for industrial scale treatment whilst for domestic treatment a low level is most preferred for economical reasons.

- 15 Accordingly, notwithstanding the advances in the art, there is still a need for an efficient and economical composition which provides effective domestic durable press properties on the treated fabrics.

It has now been found that the use of specific resin compounds fulfill such a need, and are particularly well suited for rinse application.

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Summary of the invention

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The present invention is a composition comprising:

- i)-a fabric softening compound; and
- ii)- a cross-linking resin having the property of being cationic.

- 30 In another aspect of the invention, the present invention relates to a method of treating fabric which comprises the steps of:

- i)-contacting the fabrics with an epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, and

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- ii)- curing the composition.

In a further aspect of the invention, the present invention relates to a method of treating fabric which comprises the steps of:

- i)-contacting the fabrics with a resin compound or composition as defined herein, and
- 5 ii)- curing the composition using a domestic process.

Detailed description of the invention

The present invention relates to compositions which provide effective durable press on treated fabrics, especially when treated in rinse application.

15 I-Cross-linking resin having the property of being cationic

An essential component of the invention is a cross-linking resin having the property of being cationic. By "cross-linking resin having the property of being cationic", it is meant that the resin is at least partially positively charged. It is not however necessary that the reactive part of the molecule carries the positive
20 charge. Indeed, polymeric resins can be based on positively charged monomers which help the deposition on the fibers. Since the cross-linking resins are cationic, i.e. positively charged, they are deposited and well retained on the negatively charged cellulosic fibers when these resins are added to the final rinse of a laundry process.

25 Cross-linking resins having the property of being cationic suitable for use herein are those commonly known as having wet strength in the paper field. At least two mechanisms have been postulated to account for the mechanism by which wet strength resin act. One is that wet strength resins form covalent bonds between
30 adjacent fibers while another is that the wet strength resin places a layer over the hydrogen bonds formed between adjacent paper fibers and thus prevents water from breaking the hydrogen bonds.

35 Conventional wet-strength agents suitable for use herein include compounds made of epichlorohydrin adducts of polyamines, polyethyleneimines, cationic starches, polydiallyldimethylammonium chloride, and mixtures thereof, amine-

aldehyde resins such as melamine-formaldehyde resin, amide-aldehyde resins, and mixtures thereof. For use within the meaning of the present invention, there can also be used materials of the above-mentioned classes of substances which admittedly do not themselves possess any outstanding wet-strength properties
5 but, nevertheless, have the same durable press effect as do the wet-strength agents as described therein.

Among the class of epichlorohydrin adducts of polyamines, polyethyleneimines, cationic starches, polydiallyldimethylammonium chloride, and mixtures thereof,
10 the preferred components are the polymeric amine-epichlorohydrin resins selected from the group consisting of a polyamide-epichlorohydrin (PAE) resin, a polyalkylenepolyamine-epichlorohydrin (PAPAE) resin, and an amine polymer-epichlorohydrin (APE) resin, in which the amine groups have been alkylated with epichlorohydrin to produce a polyamine-epichlorohydrin resin that has
15 azetidinium or epoxide functionality. Preferably, for use herein, the cross-linking resin having cationic properties is a cationic wet strength resin that is produced by reacting a saturated aliphatic dicarboxylic acid containing three to ten carbon atoms with a polyalkylenepolyamine, containing from two to four ethylene groups, two primary amine groups, and one to three secondary amine groups (such as
20 diethylenetriamine, triethylenetetramine and tetraethylenepentamine), to form a poly(aminoamide) having secondary amine groups that are alkylated with epichlorohydrin to form a PAE resin.

These polyamide/polyamine/epichlorohydrin wet-strength resins are fully
25 described by Carr, Doane, Hamerstrand and Hofreiter, in an article appearing in the Journal of Applied Polymer Science Vol. 17, pp. 721-735 (1973). Such resins are available as KYMENE from Hercules, Inc. A commercial synthesis of such resins from adipic acid, diethylene triamine and epichlorohydrin is described in the Carr et al publication, *ibid.*, and is U.S. Pat. No. 2,926,154 (Feb. 23, 1960) to
30 G. I. Keim or US 4,240,995. Reference can be made to these publications for further details regarding the preparation of polyamide/polyamine/epichlorohydrin resins.

Most preferred cross-linking resin having cationic properties from this class are
35 the wet strength resin Kymene 557H (available from Hercules Incorporated), in

which adipic acid is reacted with diethylenetriamine to form a poly(aminoamide) that is alkylated and crosslinked with epichlorohydrin to form a PAE resin. Still another preferred cross-linking resin having cationic properties made of epichlorohydrin are Luresin.RTM and Etadurin which both are polyamidoamine-
5 epichlorohydrin resins.

Amine-aldehyde resins are suitable cross-linking resins for the present invention and are made by condensation of amine or amide monomers with aldehydes such as formaldehyde or glyoxal. Preferred amines are those having low
10 molecular weight amines e.g. melamine or polymeric amines e.g. polydiallylamine, preferably quarternized. Preferred amides are those polymeric amides such as polyacrylamide. All these suitable amine/amide monomers can also be copolymerized with cationic monomers.

15 Among the class of amine-aldehyde cross-linking resin, preferred are those from the class of melamine-formaldehyde resin. Melamine-formaldehyde resins of this type are known as crosslinking agents of this type in the coating industry and are also described, for example, in German Auslegeschrift Nos. 2,457,387 (U.S. Pat. No. 4,035,213 incorporated herein by reference) and 1,719,324 and, in
20 particular, in U.S. Pat. No. 3,242,230 incorporated herein by reference.

Preferred melamine-formaldehyde resin are those commercially available under the tradenames Madurit, and Cassurit from Clariant.

25 Still other preferred cross-linking resin having the property of being cationic among the class of amine-aldehyde cross-linking resin are the Poly(acrylamide-glyoxal) resin commercially available under the tradename SOLIDURIT KM from Clariant.

30 According to the present invention, there can also be used a mixture of wet-strength agents of the above-mentioned types or equivalent compounds.

Preferably for the purpose of the invention, the cross-linking resin having cationic properties have a molecular weight between 200 and 1,000,000, preferably
35 between 500 and 100,000, most preferably between 1000 and 25,000. Cross-linking resin having a low molecular weight are most preferred for use in the

present invention as they are more water-soluble and have a better fiber penetration. By low molecular weight it is meant a molecular weight within the range of from 25 to 2000, preferably from 50 to 1000, and more preferably from 50 to 500.

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The above cross-linking components may be used in a composition for delivery onto fabric, such as by means of a rinse process.

It is desirable if the level of cross-linking components or derivative thereof is present in an amount of from 0.01% to 60%, preferably from 0.01% to 30% by weight of the total composition

It is advantageous for aldehyde containing cross-linking resins if a catalyst is used with compositions of the invention. Preferred catalysts includes organic acids such as citric acid, succinic acid, and tartaric acids, as well as conventional Lewis acid such as $AlCl_3$ or $MgCl_2$, or salts thereof, or mixtures thereof. A typical example of catalyst is the catalyst NKD made of a mixture of salts and organic acid, and commercially available from Hoechst.

It is preferred if the level of catalyst is from 10% to 50%, preferably from 20 to 40% by weight of the cross-linking components or derivative thereof.

For other cross-linking resins like the Kymene, the use of a catalyst is not necessary.

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Fabric softening compound

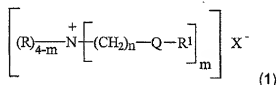
The composition of the invention also contains a fabric softening compound. Typical levels of incorporation of the softening compound in the composition are of from 1% to 80% by weight, preferably from 2% to 70%, more preferably from 5% to 60%, by weight of the composition.

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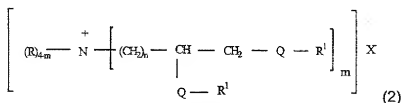
Typical of the cationic softening components are the quaternary ammonium compounds or amine precursors thereof as defined hereinafter.

35 A)-Quaternary Ammonium Fabric Softening Active Compound

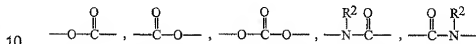
(1) Preferred quaternary ammonium fabric softening active compound have the formula



5 or the formula:

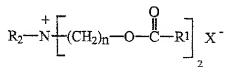


wherein Q is a carbonyl unit having the formula:



each R unit is independently hydrogen, C₁-C₆ alkyl, C₁-C₆ hydroxyalkyl, and mixtures thereof, preferably methyl or hydroxy alkyl; each R¹ unit is independently linear or branched C₁₁-C₂₂ alkyl, linear or branched C₁₁-C₂₂ alkenyl, and mixtures thereof, R² is hydrogen, C₁-C₄ alkyl, C₁-C₄ hydroxyalkyl, and mixtures thereof; X is an anion which is compatible with fabric softener actives and adjunct ingredients; the index m is from 1 to 4, preferably 2; the index n is from 1 to 4, preferably 2.

15 An example of a preferred fabric softener active is a mixture of quaternized amines having the formula:

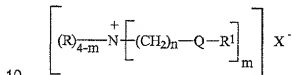


wherein R is preferably methyl; R¹ is a linear or branched alkyl or alkenyl chain comprising at least 11 atoms, preferably at least 15 atoms. In the above fabric softener example, the unit -O₂CR¹ represents a fatty acyl unit which is typically derived from a triglyceride source. The triglyceride source is preferably derived

from tallow, partially hydrogenated tallow, lard, partially hydrogenated lard, vegetable oils and/or partially hydrogenated vegetable oils, such as, canola oil, safflower oil, peanut oil, sunflower oil, corn oil, soybean oil, tall oil, rice bran oil, etc. and mixtures of these oils.

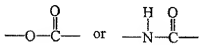
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The preferred fabric softening actives of the present invention are the Diester and/or Diamide Quaternary Ammonium (DEQA) compounds, the diesters and diamides having the formula:



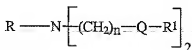
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wherein R, R¹, X, and n are the same as defined herein above for formulas (1) and (2), and Q has the formula:



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These preferred fabric softening actives are formed from the reaction of an amine with a fatty acyl unit to form an amine intermediate having the formula:

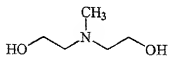


wherein R is preferably methyl, Q and R¹ are as defined herein before; followed by quaternization to the final softener active.

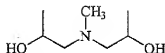
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Non-limiting examples of preferred amines which are used to form the DEQA fabric softening actives according to the present invention include methyl bis(2-hydroxyethyl)amine having the formula:

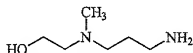
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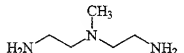
methyl bis(2-hydroxypropyl)amine having the formula:



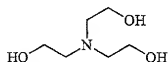
methyl (3-aminopropyl) (2-hydroxyethyl)amine having the formula:



- 5 methyl bis(2-aminoethyl)amine having the formula:

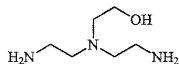


triethanol amine having the formula:



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di(2-aminoethyl) ethanolamine having the formula:



- 15 The counterion, $X^{(-)}$ above, can be any softener-compatible anion, preferably the anion of a strong acid, for example, chloride, bromide, methylsulfate, ethylsulfate, sulfate, nitrate and the like, more preferably chloride or methyl sulfate. The anion can also, but less preferably, carry a double charge in which case $X^{(-)}$ represents half a group.

- 20 Tallow and canola oil are convenient and inexpensive sources of fatty acyl units which are suitable for use in the present invention as R^1 units. The following are non-limiting examples of quaternary ammonium compounds suitable for use in the compositions of the present invention. The term "tallowyl" as used herein below indicates the R^1 unit is derived from a tallow triglyceride source and is a

mixture of fatty alkyl or alkenyl units. Likewise, the use of the term canolyl refers to a mixture of fatty alkyl or alkenyl units derived from canola oil.

- In the following table are described non-limiting examples of suitable fabric softener according to the above formula. In this list, the term "oxy" defines a

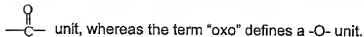


Table II

Fabric Softener Actives

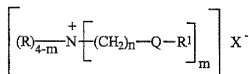
- | | |
|----|--|
| 10 | N,N-di(tallowyl-oxy-2-oxo-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium chloride; |
| | N,N-di(canolyl-oxy-2-oxo-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium chloride; |
| | N,N-di(tallowyloxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride; |
| 15 | N,N-di(canolyl-oxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride |
| | N,N,N-tri(tallowyl-oxy-2-oxo-ethyl)-N-methyl ammonium chloride; |
| | N,N,N-tri(canolyl-oxy-2-oxo-ethyl)-N-methyl ammonium chloride; |
| | N-(tallowyloxy-2-oxo-ethyl)-N-(tallowyl)-N,N-dimethyl ammonium chloride; |
| | N-(canolyloxy-2-oxo-ethyl)-N-(canolyl)-N,N-dimethyl ammonium chloride; |
| 20 | 1,2-di(tallowyloxy-oxo)-3-N,N,N-trimethylammoniopropane chloride; and |
| | 1,2-di(canolyl-oxy-oxo)-3-N,N,N-trimethylammoniopropane chloride; |
| | and mixtures of the above actives. |

- Other examples of quaternary ammonium softening compounds are
- 25 methylbis(tallowamidoethyl)(2-hydroxyethyl)ammonium methylsulfate and methylbis(hydrogenated tallowamidoethyl)(2-hydroxyethyl)ammonium methylsulfate; these materials are available from Witco Chemical Company under the trade names Varisoft® 222 and Varisoft® 110, respectively.
- 30 Particularly preferred is N,N-di(tallowyl-oxy-2-oxo-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium chloride, where the tallow chains are at least partially unsaturated.

- The level of unsaturation contained within the tallow, canola, or other fatty acyl
- 35 unit chain can be measured by the Iodine Value (IV) of the corresponding fatty

acid, which in the present case should preferably be in the range of from 5 to 100 with two categories of compounds being distinguished, having a IV below or above 25.

- 5 Indeed, for compounds having the formula:



- derived from tallow fatty acids, when the Iodine Value is from 5 to 25, preferably 15 to 20, it has been found that a *cis/trans* isomer weight ratio greater than about 30/70, preferably greater than about 50/50 and more preferably greater than about 70/30 provides optimal concentrability.

For compounds of this type made from tallow fatty acids having a Iodine Value of above 25, the ratio of *cis* to *trans* isomers has been found to be less critical unless very high concentrations are needed.

- 15 Other suitable examples of fabric softener actives are derived from fatty acyl groups wherein the terms "tallowyl" and "canolyl" in the above examples are replaced by the terms "cocoyl, palmyl, lauryl, oleyl, ricinoleyl, stearyl, palmityl," which correspond to the triglyceride source from which the fatty acyl units are derived. These alternative fatty acyl sources can comprise either fully saturated, 20 or preferably at least partly unsaturated chains.

- As described herein before, R units are preferably methyl, however, suitable fabric softener actives are described by replacing the term "methyl" in the above examples in Table II with the units "ethyl, ethoxy, propyl, propoxy, isopropyl, 25 butyl, isobutyl and t-butyl.

- The counter ion, X, in the examples of Table II can be suitably replaced by bromide, methylsulfate, formate, sulfate, nitrate, and mixtures thereof. In fact, the anion, X, is merely present as a counterion of the positively charged 30 quaternary ammonium compounds. The scope of this invention is not considered limited to any particular anion.

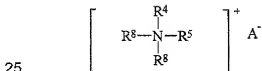
For the preceding ester fabric softening agents, the pH of the compositions herein is an important parameter of the present invention. Indeed, it influences

the stability of the quaternary ammonium or amine precursors compounds, especially in prolonged storage conditions.

- As used herein, when the diester is specified, it will include the monoester that is normally present in manufacture. For softening, under no/low detergent carry-over laundry conditions the percentage of monoester should be as low as possible, preferably no more than about 2.5%. However, under high detergent carry-over conditions, some monoester is preferred. The overall ratios of diester to monoester are from about 100:1 to about 2:1, preferably from about 50:1 to about 5:1, more preferably from about 13:1 to about 8:1. Under high detergent carry-over conditions, the di/monoester ratio is preferably about 11:1. The level of monoester present can be controlled in the manufacturing of the softener compound.
- 15 Mixtures of actives of formula (1) and (2) may also be prepared.

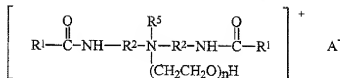
- 2) Still other suitable quaternary ammonium fabric softening compounds for use herein are cationic nitrogenous salts having two or more long chain acyclic aliphatic C₈-C₂₂ hydrocarbon groups or one said group and an arylalkyl group which can be used either alone or as part of a mixture are selected from the group consisting of:

(i) acyclic quaternary ammonium salts having the formula:



wherein R⁴ is an acyclic aliphatic C₈-C₂₂ hydrocarbon group, R⁵ is a C₁-C₄ saturated alkyl or hydroxyalkyl group, R⁸ is selected from the group consisting of R⁴ and R⁵ groups, and A⁻ is an anion defined as above;

(ii) diamino alkoxyated quaternary ammonium salts having the formula:



wherein n is equal to 1 to about 5, and R¹, R², R⁵ and A⁻ are as defined above;
(iii) mixtures thereof.

5

Examples of the above class cationic nitrogenous salts are the well-known dialkyldi methylammonium salts such as ditallowdimethylammonium chloride, ditallowdimethylammonium methylsulfate, di(hydrogenatedtallow)dimethylammonium chloride, distearyldimethylammonium chloride, dibehenyldimethylammonium chloride. Di(hydrogenatedtallow)di methylammonium chloride and ditallowdimethylammonium chloride are preferred. Examples of commercially available dialkyldimethyl ammonium salts usable in the present invention are di(hydrogenatedtallow)dimethylammonium chloride (trade name Adogen® 442), ditallowdimethylammonium chloride (trade name Adogen® 470, Praepagen® 3445), distearyl dimethylammonium chloride (trade name Arosurf® TA-100), all available from Witco Chemical Company. Dibehenyldimethylammonium chloride is sold under the trade name Kemamine Q-2802C by Humko Chemical Division of Witco Chemical Corporation. Dimethylstearylbenzyl ammonium chloride is sold under the trade names Varisoft ® SDC by Witco Chemical Company and Ammonyx® 490 by Onyx Chemical Company.

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B)-Amine Fabric Softening Active Compound

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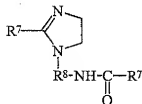
Suitable amine fabric softening compounds for use herein, which may be in amine form or cationic form are selected from:

30

(i)- Reaction products of higher fatty acids with a polyamine selected from the group consisting of hydroxyalkylalkylenediamines and dialkylenetriamines and mixtures thereof. These reaction products are mixtures of several compounds in view of the multi-functional structure of the polyamines.

The preferred Component (i) is a nitrogenous compound selected from the group consisting of the reaction product mixtures or some selected components of the mixtures.

One preferred component (i) is a compound selected from the group consisting of substituted imidazoline compounds having the formula:



- 5 wherein R⁷ is an acyclic aliphatic C₁₅-C₂₁ hydrocarbon group and R⁸ is a divalent C₁-C₃ alkylene group.

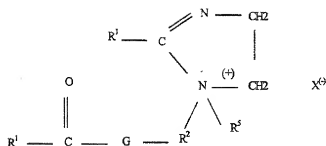
Component (i) materials are commercially available as: Mazamide® 6, sold by Mazer Chemicals, or Ceranine® HC, sold by Sandoz Colors & Chemicals; stearic hydroxyethyl imidazoline sold under the trade names of Alkazine® ST by Alkaril Chemicals, Inc., or Schercozoline® S by Scher Chemicals, Inc.; N,N"-ditallowalkoyldiethylenetriamine; 1-tallowamidoethyl-2-tallowimidazoline (wherein in the preceding structure R¹ is an aliphatic C₁₅-C₁₇ hydrocarbon group and R⁸ is a divalent ethylene group).

15

Both N,N"-ditallowalkoyldiethylenetriamine and 1-tallow(amidoethyl)-2-tallowimidazoline are reaction products of tallow fatty acids and diethylenetriamine, and are precursors of the cationic fabric softening agent methyl-1-tallowamidoethyl-2-tallowimidazolinium methylsulfate (see "Cationic Surface Active Agents as Fabric Softeners," R. R. Egan, Journal of the American Oil Chemicals' Society, January 1978, pages 118-121). N,N"-ditallow alkoyldiethylenetriamine and 1-tallowamidoethyl-2-tallowimidazoline can be obtained from Witco Chemical Company as experimental chemicals. Methyl-1-tallowamidoethyl-2-tallowimidazolinium methylsulfate is sold by Witco Chemical Company under the tradename Varisoft® 475.

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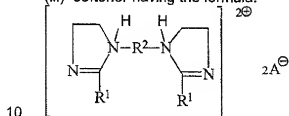
(ii)-softener having the formula:



wherein each R² is a C₁₋₆ alkylene group, preferably an ethylene group; and G is an oxygen atom or an -NR- group; and each R, R¹, R² and R⁵ have the definitions given above and A⁻ has the definitions given above for X⁻.

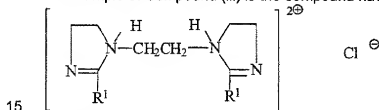
An example of Compound (ii) is 1-oleylamidoethyl-2-oleylimidazolium chloride wherein R¹ is an acyclic aliphatic C₁₅-C₁₇ hydrocarbon group, R² is an ethylene group, G is a NH group, R⁵ is a methyl group and A⁻ is a chloride anion.

(iii)- softener having the formula:



wherein R, R¹, R², and A⁻ are defined as above.

An example of Compound (iii) is the compound having the formula:



wherein R¹ is derived from oleic acid,

Additional fabric softening agents useful herein are described in U.S. Pat. No. 4,661,269, issued April 28, 1987, in the names of Toan Trinh, Errol H. Wahl, Donald M. Swartley, and Ronald L. Hemingway; U.S. Pat. No. 4,439,335, Burns, issued March 27, 1984; and in U.S. Pat. Nos.: 3,861,870, Edwards and Diehl; 4,308,151, Cambre; 3,886,075, Bernardino; 4,233,164, Davis; 4,401,578,

Verbruggen; 3,974,076, Wiersema and Rieke; 4,237,016, Rudkin, Clint, and Young; and European Patent Application publication No. 472,178, by Yamamura et al., all of said documents being incorporated herein by reference.

- 5 Of course, the term "softening active" can also encompass mixed softening active agents.

Preferred among the classes of softener compounds disclosed herein before are the diester or diamido quaternary ammonium fabric softening active compound (DEQA).

10

Fully formulated fabric softening compositions may contain, in addition to the hereinbefore described components, one or more of the following ingredients.

OPTIONAL INGREDIENTS

15

(1) Liquid carrier

Another optional, but preferred, ingredient is a liquid carrier. The liquid carrier employed in the instant compositions is preferably at least primarily water due to its low cost, relative availability, safety, and environmental compatibility. The level of water in the liquid carrier is preferably at least about 50%, most preferably at least about 60%, by weight of the carrier. Mixtures of water and low molecular weight, e.g., <about 200, organic solvent, e.g., lower alcohols such as ethanol, propanol, isopropanol or butanol are useful as the carrier liquid. Low molecular weight alcohols include monohydric, dihydric (glycol, etc.) trihydric (glycerol, etc.), and higher polyhydric (polyols) alcohols.

25

(2) Dispersibility Aids

Relatively concentrated compositions containing both saturated and unsaturated diester quaternary ammonium compounds can be prepared that are stable without the addition of concentration aids. However, the compositions of the present invention may require organic and/or inorganic concentration aids to go to even higher concentrations and/or to meet higher stability standards depending on the other ingredients. These concentration aids which typically can be viscosity modifiers may be needed, or preferred, for ensuring stability under extreme conditions when particular softener active levels are used. The surfactant concentration aids are typically selected from the group consisting of

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(1) single long chain alkyl cationic surfactants; (2) nonionic surfactants; (3) amine oxides; (4) fatty acids; and (5) mixtures thereof. These aids are described in WO 94/20597, specifically on page 14, line 12 to page 20, line 12, which is herein incorporated by reference.

- 5 When said dispersibility aids are present, the total level is from 0.1% to 20%, preferably from 0.2% to 10%, more preferably from 0.5% to 5%, and even more preferably from 1% to 2% by weight of the composition. These materials can either be added as part of the active softener raw material, (I), e.g., the mono-long chain alkyl cationic surfactant and/or the fatty acid which are reactants used
10 to form the biodegradable fabric softener active as discussed hereinbefore, or added as a separate component. The total level of dispersibility aid includes any amount that may be present as part of component (I).

- Inorganic viscosity/dispersibility control agents which can also act like or
15 augment the effect of the surfactant concentration aids, include water-soluble, ionizable salts which can also optionally be incorporated into the compositions of the present invention. A wide variety of ionizable salts can be used. Examples of suitable salts are the halides of the Group IA and IIA metals of the Periodic Table of the Elements, e.g., calcium chloride, magnesium chloride, sodium
20 chloride, potassium bromide, and lithium chloride. The ionizable salts are particularly useful during the process of mixing the ingredients to make the compositions herein, and later to obtain the desired viscosity. The amount of ionizable salts used depends on the amount of active ingredients used in the compositions and can be adjusted according to the desires of the formulator.
25 Typical levels of salts used to control the composition viscosity are from about 20 to about 20,000 parts per million (ppm), preferably from about 20 to about 11,000 ppm, by weight of the composition.

- Alkylene polyammonium salts can be incorporated into the composition to give
viscosity control in addition to or in place of the water-soluble, ionizable salts
30 above. In addition, these agents can act as scavengers, forming ion pairs with anionic detergent carried over from the main wash, in the rinse, and on the fabrics, and may improve softness performance. These agents may stabilize the viscosity over a broader range of temperature, especially at low temperatures, compared to the inorganic electrolytes.

- 35 Specific examples of alkylene polyammonium salts include L-lysine monohydrochloride and 1,5-diammonium 2-methyl pentane dihydrochloride.

(3)-Stabilizers

Stabilizers can be present in the compositions of the present invention. The term "stabilizer," as used herein, includes antioxidants and reductive agents. These agents are present at a level of from 0% to about 2%, preferably from about 0.01% to about 0.2%, more preferably from about 0.035% to about 0.1% for antioxidants, and more preferably from about 0.01% to about 0.2% for reductive agents. These assure good odor stability under long term storage conditions for the compositions and compounds stored in molten form. The use of antioxidants and reductive agent stabilizers is especially critical for low scent products (low perfume).

Examples of antioxidants that can be added to the compositions of this invention include a mixture of ascorbic acid, ascorbic palmitate, propyl gallate, available from Eastman Chemical Products, Inc., under the trade names Tenox® PG and Tenox S-1; a mixture of BHT (butylated hydroxytoluene), BHA (butylated hydroxyanisole), propyl gallate, and citric acid, available from Eastman Chemical Products, Inc., under the trade name Tenox-6; butylated hydroxytoluene, available from UOP Process Division under the trade name Sustane® BHT; tertiary butylhydroquinone, Eastman Chemical Products, Inc., as Tenox TBHQ; natural tocopherols, Eastman Chemical Products, Inc., as Tenox GT-1/GT-2; and butylated hydroxyanisole, Eastman Chemical Products, Inc., as BHA; long chain esters (C8-C22) of gallic acid, e.g., dodecyl gallate; Irganox® 1010; Irganox® 1035; Irganox® B 1171; Irganox® 1425; Irganox® 3114; Irganox® 3125; and mixtures thereof; preferably Irganox® 3125, Irganox® 1425, Irganox® 3114, and mixtures thereof; more preferably Irganox® 3125 alone. The chemical names and CAS numbers for some of the above stabilizers are listed in Table II below.

TABLE II

Antioxidant	CAS No.	Chemical Name used in Code of Federal Regulations
Irganox® 1010	6683-19-8	Tetrakis (methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)) methane
Irganox® 1035	41484-35-9	Thiodiethylene bis(3,5-di-tert-butyl-4-hydroxyhydrocinnamate
Irganox® 1098	23128-74-7	N,N'-Hexamethylene bis(3,5-di-tert-butyl-4-

		hydroxyhydrocinnamamide
	Irganox® B 1171	31570-04-4
		23128-74-7 1:1 Blend of Irganox® 1098 and Irgafos® 168
5	Irganox® 1425	65140-91-2 Calcium bis(monoethyl(3,5-di-tert-butyl-4-hydroxybenzyl)phosphonate)
	Irganox® 3114	65140-91-2 Calcium bis(monoethyl(3,5-di-tert-butyl-4-hydroxybenzyl)phosphonate)
	Irganox® 3125	34137-09-2 3,5-Di-tert-butyl-4-hydroxy-hydrocinnamic acid triester with 1,3,5-tris(2-hydroxyethyl)-S-triazine-2,4,6-(1H, 3H, 5H)-trione
10	Irgafos® 168	31570-04-4 Tris(2,4-di-tert-butyl-phenyl)phosphite

Examples of reductive agents include sodium borohydride, hypophosphorous acid, Irgafos® 168, and mixtures thereof.

15

4- Antimicrobial active

The composition may suitably use an optional solubilized, water-soluble antimicrobial active, useful in providing protection against organisms that become attached to the treated material. The free, uncomplexed antimicrobial, e.g.,
 20 antibacterial, active provides an optimum antibacterial performance.

Sanitization of fabrics can be achieved by the compositions of the present invention containing, antimicrobial materials, e.g., antibacterial halogenated compounds, quaternary compounds, and phenolic compounds.

25

Biguanides. Some of the more robust antimicrobial halogenated compounds which can function as disinfectants/sanitizers as well as finish product preservatives (vide infra), and are useful in the compositions of the present invention include 1,1'-hexamethylene bis(5-(p-chlorophenyl)biguanide),
 30 commonly known as chlorhexidine, and its salts, e.g., with hydrochloric, acetic and gluconic acids. The digluconate salt is highly water-soluble, about 70% in water, and the diacetate salt has a solubility of about 1.8% in water. When chlorhexidine is used as a sanitizer in the present invention it is typically present at a level of from about 0.001% to about 0.4%, preferably from about 0.002% to
 35 about 0.3%, and more preferably from about 0.01% to about 0.1%, by weight of

the usage composition. In some cases, a level of from about 1% to about 2% may be needed for virucidal activity.

Other useful biguanide compounds include Cosmocel® CQ®, Vantocil® IB, including poly (hexamethylene biguanide) hydrochloride. Other useful cationic antimicrobial agents include the bis-biguanide alkanes. Usable water soluble salts of the above are chlorides, bromides, sulfates, alkyl sulfonates such as methyl sulfonate and ethyl sulfonate, phenylsulfonates such as p-methylphenyl sulfonates, nitrates, acetates, gluconates, and the like.

As stated hereinbefore, the bis biguanide of choice is chlorhexidine and its salts, e.g., digluconate, dihydrochloride, diacetate, and mixtures thereof.

Quaternary Compounds. A wide range of quaternary compounds can also be used as antimicrobial actives, in conjunction with the preferred surfactants, for compositions of the present invention that do not contain cyclodextrin. Non-limiting examples of useful quaternary compounds include: (1) benzalkonium chlorides and/or substituted benzalkonium chlorides such as commercially available Barquat® (available from Lonza), Maquat® (available from Mason), Variquat® (available from Witco/Sherex), and Hyamine® (available from Lonza); (2) dialkyl quaternary such as Bardac® products of Lonza, (3) N-(3-chloroallyl) hexaminium chlorides such as Dowicide® and Dowicil® available from Dow; (4) benzethonium chloride such as Hyamine® 1622 from Rohm & Haas; (5) methylbenzethonium chloride represented by Hyamine® 10X supplied by Rohm & Haas, (6) cetylpyridinium chloride such as Cepacol chloride available from Merrell Labs. Typical concentrations for biocidal effectiveness of these quaternary compounds range from about 0.001% to about 0.8%, preferably from about 0.005% to about 0.3%, more preferably from about 0.01% to 0.2%, by weight of the usage composition. The corresponding concentrations for the concentrated compositions are from about 0.003% to about 2%, preferably from about 0.006% to about 1.2%, and more preferably from about 0.1% to about 0.8% by weight of the concentrated compositions.

Other preservatives which are conventional in the art, such as described in US 5,593, 670 incorporated herein by reference, may also be used herein.

5-Perfume

The present invention can contain a perfume. Suitable perfumes are disclosed in U.S. Pat. 5,500,138, said patent being incorporated herein by reference.

- 5 As used herein, perfume includes fragrant substance or mixture of substances including natural (i.e., obtained by extraction of flowers, herbs, leaves, roots, barks, wood, blossoms or plants), artificial (i.e., a mixture of different nature oils or oil constituents) and synthetic (i.e., synthetically produced) odoriferous substances. Such materials are often accompanied by auxiliary materials, such as fixatives, extenders, stabilizers and solvents. These auxiliaries are also included within the meaning of "perfume", as used herein. Typically, perfumes are complex mixtures of a plurality of organic compounds.

- Examples of perfume ingredients useful in the perfumes of the present invention compositions include, but are not limited to, hexyl cinnamic aldehyde; amyl cinnamic aldehyde; amyl salicylate; hexyl salicylate; terpineol; 3,7-dimethyl-*cis*-2,6-octadien-1-ol; 2,6-dimethyl-2-octanol; 2,6-dimethyl-7-octen-2-ol; 3,7-dimethyl-3-octanol; 3,7-dimethyl-*trans*-2,6-octadien-1-ol; 3,7-dimethyl-6-octen-1-ol; 3,7-dimethyl-1-octanol; 2-methyl-3-(para-*tert*-butylphenyl)-propionaldehyde; 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde; tricyclodecenyl propionate; tricyclodecenyl acetate; anisaldehyde; 2-methyl-2-(para-*iso*-propylphenyl)-propionaldehyde; ethyl-3-methyl-3-phenyl glycidate; 4-(para-hydroxyphenyl)-butan-2-one; 1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-2-buten-1-one; para-methoxyacetophenone; para-methoxy- α -phenylpropene; methyl-2-n-hexyl-3-oxo-cyclopentane carboxylate; undecalactone gamma.

- Additional examples of fragrance materials include, but are not limited to, orange oil; lemon oil; grapefruit oil; bergamot oil; clove oil; dodecalactone gamma; methyl-2-(2-pentyl-3-oxo-cyclopentyl) acetate; beta-naphthol methylether; methyl-beta-naphthylketone; coumarin; decylaldehyde; benzaldehyde; 4-*tert*-butylcyclohexyl acetate; α,α -dimethylphenethyl acetate; methylphenylcarbonyl acetate; Schiff's base of 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate; cyclic ethyleneglycol diester of tridecandioic acid; 3,7-dimethyl-2,6-octadiene-1-nitrile; ionone gamma methyl; ionone alpha; ionone beta; petitgrain; methyl cedrylone; 7-acetyl-1,2,3,4,5,6,7,8-octahydro-1,1,6,7-tetramethyl-naphthalene; ionone methyl;

- methyl-1,6,10-trimethyl-2,5,9-cyclododecatrien-1-yl ketone; 7-acetyl-1,1,3,4,4,6-hexamethyl tetralin; 4-acetyl-6-tert-butyl-1,1-dimethyl indane; benzophenone; 6-acetyl-1,1,2,3,3,5-hexamethyl indane; 5-acetyl-3-isopropyl-1,1,2,6-tetramethyl indane; 1-dodecanal; 7-hydroxy-3,7-dimethyl octanal; 10-undecen-1-al; isohexenyl cyclohexyl carboxaldehyde; formyl tricyclodecan; cyclopentadecanolide; 16-hydroxy-9-hexadecenoic acid lactone; 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-gamma-2-benzopyrane; ambroxane; dodecahydro-3a,6,6,9a-tetramethylnaphtho-[2,1b]furan; cedrol; 5-(2,2,3-trimethylcyclopent-3-enyl)-3-methylpentan-2-ol; 2-ethyl-4-(2,2,3-trimethyl-3-cyclopenten-1-yl)-2-buten-1-ol; caryophyllene alcohol; cedryl acetate; para-tert-butylcyclohexyl acetate; patchouli; olibanum resinoid; labdanum; vetivert; copaiba balsam; fir balsam; and condensation products of: hydroxycitronellal and methyl anthranilate; hydroxycitronellal and indol; phenyl acetaldehyde and indol; 4-(4-hydroxy-4-methyl pentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate.
- More examples of perfume components are geraniol; geranyl acetate; linalool; linalyl acetate; tetrahydrolinalool; citronellol; citronellyl acetate; dihydromyrcenol; dihydromyrcenyl acetate; tetrahydromyrcenol; terpinyl acetate; nopol; nopyl acetate; 2-phenylethanol; 2-phenylethyl acetate; benzyl alcohol; benzyl acetate; benzyl salicylate; benzyl benzoate; styrallyl acetate; dimethylbenzylcarbinol; trichloromethylphenylcarbinyl methylphenylcarbinyl acetate; isononyl acetate; vetiveryl acetate; vetiverol; 2-methyl-3-(p-tert-butylphenyl)-propanal; 2-methyl-3-(p-isopropylphenyl)-propanal; 3-(p-tert-butylphenyl)-propanal; 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde; 4-acetoxy-3-pentyltetrahydropyran; methyl dihydrojasmonate; 2-n-heptylcyclopentanone; 3-methyl-2-pentylcyclopentanone; n-decanal; n-dodecanal; 9-decenol-1; phenoxyethyl isobutyrate; phenylacetaldehyde dimethylacetal; phenylacetaldehyde diethylacetal; geranonitrile; citronellonitrile; cedryl acetal; 3-isocamphylcyclohexanol; cedryl methylether; isolongifolanone; aubepine nitrile; aubepine; heliotropine; eugenol; vanillin; diphenyl oxide; hydroxycitronellal ionones; methyl ionones; isomethyl ionones; irones; cis-3-hexenol and esters thereof; indane musk fragrances; tetralin musk fragrances; isochroman musk fragrances; macrocyclic ketones; macrolactone musk fragrances; ethylene brassylate.

The perfumes useful in the present invention compositions are substantially free of halogenated materials and nitromusks.

Suitable solvents, diluents or carriers for perfumes ingredients mentioned above are for examples, ethanol, isopropanol, diethylene glycol, monoethyl ether, dipropylene glycol, diethyl phthalate, triethyl citrate, etc. The amount of such solvents, diluents or carriers incorporated in the perfumes is preferably kept to the minimum needed to provide a homogeneous perfume solution.

Perfume can be present at a level of from 0% to 10%, preferably from 0.1% to 5%, and more preferably from 0.2% to 3%, by weight of the finished composition. Fabric softener compositions of the present invention provide improved fabric perfume deposition.

Perfume ingredients may also be suitably added as releasable fragrances, for example, as pro-perfumes or pro-fragrances as described in U.S. 5,652,205 Hartman et al., issued July 29, 1997, WO95/04809, WO96/02625, PCT US97/14610 filed 19 August 1997 and claiming priority of 19 August 1996, and EP-A-0,752,465, incorporated herein by reference.

6- Soil Release Agent

Soil Release agents are desirably used in compositions of the instant invention. Any polymeric soil release agent known to those skilled in the art can optionally be employed in the compositions of this invention. Polymeric soil release agents are characterized by having both hydrophilic segments, to hydrophilize the surface of hydrophobic fibers, such as polyester and nylon, and hydrophobic segments, to deposit upon hydrophobic fibers and remain adhered thereto through completion of washing and rinsing cycles and, thus, serve as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to treatment with the soil release agent to be more easily cleaned in later washing procedures.

If utilized, soil release agents will generally comprise from about 0.01% to about 10.0%, by weight, of the detergent compositions herein, typically from about 0.1% to about 5%, preferably from about 0.2% to about 3.0%.

The following, all included herein by reference, describe soil release polymers suitable for use in the present invention. U.S. 3,959,230 Hays, issued May 25, 1976; U.S. 3,893,929 Basadur, issued July 8, 1975; U.S. 4,000,093, Nicol, *et al.*,

- issued December 28, 1976; U.S. Patent 4,702,857 Gosselink, issued October 27, 1987; U.S. 4,968,451, Schelbel *et al.*, issued November 6; U.S. 4,702,857, Gosselink, issued October 27, 1987; U.S. 4,711,730, Gosselink *et al.*, issued December 8, 1987; U.S. 4,721,580, Gosselink, issued January 26, 1988; U.S. 4,877,896, Maldonado *et al.*, issued October 31, 1989; U.S. 4,956,447, Gosselink *et al.*, issued September 11, 1990; U.S. 5,415,807 Gosselink *et al.*, issued May 16, 1995; European Patent Application 0 219 048, published April 22, 1987 by Kud, *et al.*
- Further suitable soil release agents are described in U.S. 4,201,824, Violland *et al.*; U.S. 4,240,918 Lagasse *et al.*; U.S. 4,525,524 Tung *et al.*; U.S. 4,579,681, Ruppert *et al.*; U.S. 4,240,918; U.S. 4,787,989; U.S. 4,525,524; EP 279,134 A, 1988, to Rhone-Poulenc Chemie; EP 457,205 A to BASF (1991); and DE 2,335,044 to Unilever N. V., 1974 all incorporated herein by reference.
- Commercially available soil release agents include the METOLOSE SM100, METOLOSE SM200 manufactured by Shin-etsu Kagaku Kogyo K.K., SOKALAN type of material, e.g., SOKALAN HP-22, available from BASF (Germany), ZELCON 5126 (from Dupont) and MILEASE T (from ICI).

7-pH

- An optional requirement of the compositions according to the present invention is that the pH is greater than 3, preferably between 3 and 12. This range is preferred for fabric safety. When a lubricant of the diester quaternary ammonium type is used, it is most preferred to have the conventional pH range, as measured in the neat compositions at 20 °C, of from 2.0 to 5, preferably in the range of 2.5 to 4.5, preferably about 2.5 to about 3.5. The pH of these compositions herein can be regulated by the addition of a Bronsted acid.

9- Other Optional Ingredients

- The present invention can include optional components conventionally used in textile treatment compositions, for example, colorants, preservatives, bactericides, optical brighteners, opacifiers, anti-shrinkage agents, germicides, fungicides, anti-oxidants, dye fixing agent, enzymes, chelating agents,

cyclodextrin, metallic salts to absorb amine and sulfur-containing compounds and selected from the group consisting of copper salts, zinc salts, and mixtures thereof, color protectors like polyethylene imine and its alkoxyated derivatives, and the like. The compositions are preferably free of any material that would soil or stain fabric, and are also substantially free of starch. Typically, there should be less than about 0.5%, by weight of the composition, preferably less than about 0.3%, more preferably less than about 0.1%, by weight of the composition, of starch and/or modified starch.

10 Form of the composition and compounds

The composition or its individual components can be provided in any suitable form such as spray, foam, gel or any other suitable form for liquid aqueous compositions.

15 Method of use

There is provided a method of treating fabrics, in particular to provide durable press on fabric, i.e. for providing wrinkle resistant fabrics, which comprises the steps of contacting the fabrics with a cross-linking compound or composition of the invention, as defined herein before, and subsequently curing the composition using a domestic process.

By "contacting", it is meant any steps that is suitable for providing a contact of the composition with the fabric. This can include by soaking, washing, rinsing, and/or spraying as well as by means of a dryer sheet onto which is adsorbed the composition. Preferably, the contacting occurs in the step of a laundering process, preferably a rinse step of a laundry process, which more preferably occurs at a temperature range below 30°C, preferably between 5 and 25°C.

Domestic curing of the fabric can be caused by the heat used to dry the fabric, e.g. by tumble drying. Ironing is also particularly advantageous for curing the fabric. Without to be bound by theory, it is believed that the shorter time or the low temperatures used to domestically cure the cross-linking components mean that the fabric is made resistant to wrinkles without changing its tactile, or drape properties.

Still another advantage of the present invention is that when epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, or polydiallyldimethylammonium chloride are used, such as in particular with Kymene compounds, the domestic curing can occur at room temperature, i.e. from 15 to 30°C.

Still a further advantage of the above mentioned epichlorohydrin adducts is their usability in industrial treatment. Accordingly, there is also provided a method for treating fabric which comprises the steps of contacting the fabrics with an epichlorohydrin adduct of polyamine resins, polyethyleneimine resins, cationic starch, or polydiallyldimethylammonium chloride, or mixtures thereof, and thereafter curing the fabrics. In this preferred method, the curing is that which is conventionally known in industrial process like padding.

The composition of the present invention can also be used as an ironing aid. An effective amount of the composition can be sprayed onto fabric, wherein said fabric should not be sprayed to saturation. The fabric can be ironed at the normal temperature at which it should be ironed. Still another preferred way of treating the fabrics is when the fabric can be sprayed with an effective amount of the composition, allowed to dry and then ironed, or sprayed and ironed immediately.

The invention is illustrated in the following non limiting examples, in which all percentages are on a weight basis unless otherwise stated.

In the examples, the abbreviated component identifications have the following meanings:

Resin #1	Polyamide/polyamine/epichlorohydrin resin commercially available under the tradename KYMENE 557 from Hercules Inc.
Resin #2	Polyamide/polyamine/epichlorohydrin resin commercially available under the tradename KYMENE 450 from Hercules Inc.
Resin #3	Melamine-formaldehyde resin commercially available under the tradename CASSURIT HML from Clariant

Resin #4	Poly(acrylamide-glyoxal) resin commercially available under the tradename SOLIDURIT KM from Clariant
Resin #5	Melamine-formaldehyde resin commercially available under the tradename MADURIT MW 167 from Clariant
Catalyst	: Catalyst NKD, made of a mixture of salts and organic acid, and commercially available from Hoechst
DEQA	: Di-(tallowyl-oxy-ethyl) dimethyl ammonium chloride
DOEQA	: Di-(oleyloxyethyl) dimethyl ammonium methylsulfate
DTDMAC	: Ditallow dimethylammonium chloride
Fatty acid	: tallow fatty acid IV=18
Electrolyte	: Calcium chloride
PEG	: Polyethylene Glycol 4000
PEI 1800 E1	: Ethoxylated polyethylene imine (MW 1800, at 50% active) as synthesised in Synthesis example 1
PEI 1200 E7	: Ethoxylated polyethylene imine (MW 1200, at 50% active in water) as synthesised per Synthesis example 2
Dye Fix 1	: Cellulose reactive dye fixing agent available under the tradename Indosol CR from Clariant

Synthesis Example 1 -Preparation of PEI 1800 E₁

- Step A)-The ethoxylation is conducted in a 2 gallon stirred stainless steel autoclave equipped for temperature measurement and control, pressure measurement, vacuum and inert gas purging, sampling, and for introduction of ethylene oxide as a liquid. A ~20 lb. net cylinder of ethylene oxide (ARC) is set up to deliver ethylene oxide as a liquid by a pump to the autoclave with the cylinder placed on a scale so that the weight change of the cylinder could be monitored.
- 5
- 10 A 750 g portion of polyethyleneimine (PEI) (Nippon Shokubai, Epomin SP-018 having a listed average molecular weight of 1800 equating to 0.417 moles of polymer and 17.4 moles of nitrogen functions) is added to the autoclave. The autoclave is then sealed and purged of air (by applying vacuum to minus 28" Hg followed by pressurization with nitrogen to 250 psia, then venting to atmospheric pressure). The autoclave contents are heated to 130 °C while applying vacuum.
- 15 After about one hour, the autoclave is charged with nitrogen to about 250 psia while cooling the autoclave to about 105 °C. Ethylene oxide is then added to the autoclave incrementally over time while closely monitoring the autoclave

pressure, temperature, and ethylene oxide flow rate. The ethylene oxide pump is turned off and cooling is applied to limit any temperature increase resulting from any reaction exotherm. The temperature is maintained between 100 and 110 °C while the total pressure is allowed to gradually increase during the course of the reaction. After a total of 750 grams of ethylene oxide has been charged to the autoclave (roughly equivalent to one mole ethylene oxide per PEI nitrogen function), the temperature is increased to 110 °C and the autoclave is allowed to stir for an additional hour. At this point, vacuum is applied to remove any residual unreacted ethylene oxide.

Step B)- The reaction mixture is then deodorized by passing about 100 cu. ft. of inert gas (argon or nitrogen) through a gas dispersion frit and through the reaction mixture while agitating and heating the mixture to 130 °C.

The final reaction product is cooled slightly and collected in glass containers purged with nitrogen.

In other preparations the neutralization and deodorization is accomplished in the reactor before discharging the product.

Synthesis Example 2 -Preparation of PEI 1200 E₁

Step A)-The ethoxylation is conducted in a 2 gallon stirred stainless steel autoclave equipped for temperature measurement and control, pressure measurement, vacuum and inert gas purging, sampling, and for introduction of ethylene oxide as a liquid. A ~20 lb. net cylinder of ethylene oxide (ARC) is set up to deliver ethylene oxide as a liquid by a pump to the autoclave with the cylinder placed on a scale so that the weight change of the cylinder could be monitored.

A 750 g portion of polyethyleneimine (PEI) (having a listed average molecular weight of 1200 equating to about 0.625 moles of polymer and 17.4 moles of nitrogen functions) is added to the autoclave. The autoclave is then sealed and purged of air (by applying vacuum to minus 28" Hg followed by pressurization with nitrogen to 250 psia, then venting to atmospheric pressure). The autoclave contents are heated to 130 °C while applying vacuum. After about one hour, the autoclave is charged with nitrogen to about 250 psia while cooling the autoclave to about 105 °C. Ethylene oxide is then added to the autoclave incrementally over time while closely monitoring the autoclave pressure, temperature, and ethylene oxide flow rate. The ethylene oxide pump is turned off and cooling is

- applied to limit any temperature increase resulting from any reaction exotherm. The temperature is maintained between 100 and 110 °C while the total pressure is allowed to gradually increase during the course of the reaction. After a total of 750 grams of ethylene oxide has been charged to the autoclave (roughly equivalent to one mole ethylene oxide per PEI nitrogen function), the temperature is increased to 110 °C and the autoclave is allowed to stir for an additional hour. At this point, vacuum is applied to remove any residual unreacted ethylene oxide.
- 10 Step B)- The reaction mixture is then deodorized by passing about 100 cu. ft. of inert gas (argon or nitrogen) through a gas dispersion frit and through the reaction mixture while agitating and heating the mixture to 130 °C. The final reaction product is cooled slightly and collected in glass containers purged with nitrogen.
- 15 In other preparations the neutralization and deodorization is accomplished in the reactor before discharging the product.
- If a PEI 1200 E7 is desired, the following step of catalyst addition will be included between Step A and B.
- 20 Vacuum is continuously applied while the autoclave is cooled to about 50 °C while introducing 376 g of a 25% sodium methoxide in methanol solution (1.74 moles, to achieve a 10% catalyst loading based upon PEI nitrogen functions). The methoxide solution is sucked into the autoclave under vacuum and then the autoclave temperature controller setpoint is increased to 130 °C. A device is used to monitor the power consumed by the agitator. The agitator power is monitored along with the temperature and pressure. Agitator power and temperature values gradually increase as methanol is removed from the autoclave and the viscosity of the mixture increases and stabilizes in about 1 hour indicating that most of the methanol has been removed. The mixture is further heated and agitated under vacuum for an additional 30 minutes.
- 30 Vacuum is removed and the autoclave is cooled to 105 °C while it is being charged with nitrogen to 250 psia and then vented to ambient pressure. The autoclave is charged to 200 psia with nitrogen. Ethylene oxide is again added to the autoclave incrementally as before while closely monitoring the autoclave pressure, temperature, and ethylene oxide flow rate while maintaining the temperature between 100 and 110 °C and limiting any temperature increases
- 35

due to reaction exotherm. After the addition of 4500 g of ethylene oxide (resulting in a total of 7 moles of ethylene oxide per mole of PEI nitrogen function) is achieved over several hours, the temperature is increased to 110 °C and the mixture stirred for an additional hour.

- 5 The reaction mixture is then collected in nitrogen purged containers and eventually transferred into a 22 L three neck round bottomed flask equipped with heating and agitation. The strong alkali catalyst is neutralized by adding 167 g methane sulfonic acid (1.74 moles).
- 10 Other preferred examples such as PEI 1200 E2, PEI 1200 E3, PEI 1200 E15 and PEI 1200 E20 can be prepared by the above method by adjusting the reaction time and the relative amount of ethylene oxide used in the reaction.

The invention is illustrated in the following non limiting examples, in which all

- 15 percentages are on a weight basis unless otherwise stated.

Example

The following compositions A to J are in accordance with the invention.

	A	B	C	D	E	F	G	H	I	J
Resin #1	15	-	-	-	-	-	-	-	-	12
Resin #2	-	25	-	-	-	-	-	-	15	-
Resin #3	-	-	50	50	50	10	-	-	-	-
Resin #4	-	-	-	-	-	-	30	-	-	-
Resin #5	-	-	-	-	-	-	-	30	30	30
DEQA	-	-	5	-	5	1	-	5	5	5
DOEQA	-	5	-	-	-	-	5	-	-	-
DTDMAC	10	-	-	-	-	-	-	-	-	-
Fatty acid	-	-	-	-	-	2	-	-	-	-
Electrolyte	-	-	-	-	-	-	-	-	-	2
PEG	-	-	-	3	-	-	-	-	2	-
PEI 1800 E1	-	-	-	-	-	-	-	10	-	-
PEI 1200 E7	-	-	-	-	5	-	-	-	5	-
Dye Fix 1	-	-	-	-	5	-	-	-	5	3
Catalyst	-	-	20	-	20	3	10	10	-	-

water and minors to balance to 100%

Claims

1- A composition comprising:

- i)-a fabric softening compound; and
- ii)- a cross-linking resin having the property of being cationic.

2-A composition according to Claim 1, wherein said cross-linking resin compound is selected from amine-aldehyde resins, amide-aldehyde resins, epichlorohydrin adducts of polyamines, polyethyleneimines, cationic starches, polydiallyldimethylammonium chloride, and mixtures thereof, and mixtures thereof.

3-A composition according to Claim 1, wherein said cross-linking resin is a polyamine epichlorohydrin resin selected from selected from the group consisting of a polyamide-epichlorohydrin, a polyalkylenepolyamine-epichlorohydrin, and an amine polymer-epichlorohydrin.

4-A composition according to any one of Claims 1-3, wherein said cross-linking resin has a molecular weight between 200 and 1,000,000, preferably between 500 and 100,000.

5- A composition according to any one of Claims 1-4, wherein said cross-linking resin is present in an amount of from 0.01% to 60%, preferably from 0.01% to 30% by weight of the total composition.

6- A composition according to any one of Claims 1-5, wherein said cross-linking resin is an aldehyde containing cross-linking resin, and wherein said composition further comprises a catalyst, preferably present in an amount of from 10% to 50%, by weight of the cross-linking components or derivative thereof.

7- A composition according to any one of Claims 1-6, wherein the softening compound is a quaternary ammonium compounds or amine precursors thereof.

8- A method of treating fabrics which comprises the steps of:

- i)-contacting the fabrics with a resin compound or composition as defined in any one of Claims 1-7, and
- ii)- curing the composition using a domestic process.

9-A method of treating fabrics which comprises the steps of:

- i)-contacting the fabrics with an epichlorohydrin adducts of polyamines, polyethyleneimines, cationic starches, polydiallyldimethylammonium chloride, and mixtures thereof, and
- ii)- curing the composition.

10-A method according to either one of Claim 8 or 9, wherein said contacting occurs in the rinse process.

11-A method according to any one of Claims 8-10, wherein said contacting occurs at a temperature range below 30°C, preferably between 5 and 25°C.

INTERNATIONAL SEARCH REPORT

 Intr. National Application No
 PC: US 99/17554

A. CLASSIFICATION OF SUBJECT MATTER

 IPC 7 C11D3/00 C11D3/37 C11D3/22 D06M15/423 D06M15/11
 D06M15/61 D06M13/463

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C11D D06M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	WO 96 15310 A (PROCTER & GAMBLE) 23 May 1996 (1996-05-23) page 14, line 11 -page 16, line 14	1,8
A	US 4 376 633 A (REINHARDT ROBERT M ET AL) 15 March 1983 (1983-03-15) column 3, line 23 - line 44	1,8
A	EP 0 363 346 A (PROCTER & GAMBLE) 11 April 1990 (1990-04-11) page 3, line 40 -page 5, line 31 page 7; claims	1,8

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"S" document member of the same patent family

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Information on patent family members

International Application No.

PC1/US 99/17554

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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FABRIC CARE COMPOSITION

(57) Abstract: A fabric care composition comprises a polymeric material which is capable of self cross-linking and/or of reacting with cellulose together with one or more textile compatible carriers, wherein the polymeric material comprises one or more poly(oxyalkylene) groups having an end group which comprises one or more amino groups or derivatives of said amino groups. The compositions may be used to treat fabric as part of a laundering process and improve the surface colour definition of the fabric following multiple washings.

WO 01/27232 A1

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FABRIC CARE COMPOSITION

Technical Field

- 5 This invention relates to fabric care compositions and to methods of treating fabric using the compositions or the polymeric materials they contain.

Background and Prior Art

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The laundry process generally has several benefits for fabric, the most common being to remove dirt and stains from the fabric during the wash cycle and to soften the fabric during the rinse cycle. However, there are numerous
15 disadvantages associated with repeated use of conventional laundry treatment compositions and/or the actual laundry process; one of these being a fairly harsh treatment of fabric in the laundry process.

- 20 Fabrics can be damaged in several ways as a result of repeated laundering and/or wear. Fabric pilling and loss of fabric surface appearance e.g. fuzzing, shrinkage (or expansion), loss of colour from the fabric or running of colour on the fabric (usually termed dye transfer) are some
25 of the common problems associated with repeated laundering. These problems may occur merely from repeated hand washing as well as the more vigorous machine washing process. Furthermore, problems relating to damage of fabric over time through normal use, such as loss of shape and increased
30 likelihood of wrinkling are also significant.

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The present invention is directed towards alleviating one or more of the problems referred to hereinabove.

The principal advantage of the present invention relates to
5 improving the surface colour definition of a fabric after
multiple washings and/or to imparting pill and/or fuzz
resistance to fabric during laundering. The invention can
have further advantages in the treatment of fabric. For
example, other aspects of the overall appearance of the
10 fabric can be improved, such as a reduction in the tendency
of the fabric to become creased and/or wrinkled.

Laundry detergent compositions containing polyamide-
polyamine fabric treatment agents are described in WO
15 98/29530. The compositions are claimed to impart improved
overall appearance to fabrics laundered using the detergent
compositions, in terms of surface appearance properties such
as pill/fuzz reduction and antifading. Laundry compositions
containing polyamide-polyamine treatment agents of similar
20 types are taught in WO 97/42287.

Laundry compositions containing polyamide-polyamine fabric
treatment agents can exhibit increased dye pick-up (ie,
increased dye transfer) and poor stain removal properties
25 compared to other conventional laundry compositions.

US 5571286 (Connell et al) discloses certain polymers and
prepolymers derived from polyoxyalkyleneamines and their use
in a process for shrink-proofing wool. The treated wool may
30 also have a softer handle than untreated wool. This
document does not mention the treatment of cellulosic

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fabrics or the problems of loss of fabric surface appearance that they can experience following laundering. Furthermore, it deals entirely with treatment of wool on an industrial scale and does not mention the application of the
5 compositions to fabric in the context of laundering processes.

The present invention is based on the surprising finding that certain polymeric materials, including those described
10 in US 5571286, can impart improved surface appearance to cellulosic fabrics. The polymeric materials can have the further advantage of reduced adverse side-effects, in terms of increased dye transfer and poor stain removal, for example, compared to certain compositions containing
15 polyamide-polyamine fabric treatment agents.

Definition of the Invention

According to the present invention, there is provided a
20 fabric care composition comprising a polymeric material which is capable of self cross-linking and/or of reacting with cellulose together with one or more textile compatible carriers, in which when the textile compatible carrier is water a further additive suitable for use in laundry
25 compositions is present, wherein the polymeric material comprises one or more poly(oxyalkylene) groups having an end group which comprises one or more amino groups or derivatives of said amino groups.

30 The invention also provides a method of treating fabric, as part of a laundering process, which comprises applying to

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the fabric a fabric care composition of the invention or a polymeric material which is a component of the fabric care composition of the invention.

- 5 Further provided by the invention in another aspect is the use of a fabric care composition of the invention or a polymeric material which is a component of the fabric care composition of the invention to improve the surface colour definition of a fabric after multiple washings.

10

In another aspect, the invention provides the use of a fabric care composition of the invention or a polymeric material which is a component of the fabric care composition of the invention to impart pill and/or fuzz resistance to fabric during laundering. In addition, the invention can impart other beneficial properties to the fabric, such as reduced creasing and/or wrinkling of the fabric during laundering.

15

20 Detailed Description of the Invention

The compositions of the present invention comprise a polymeric material which is capable of self cross-linking and/or of reacting with cellulose together with one or more textile compatible carriers, wherein the polymeric material comprises one or more poly(oxyalkylene) groups having an end group which comprises one or more amino groups or derivatives of said amino groups.

25

30

- 5 -

The compositions of the invention have the surprising advantage of imparting wear resistance to fabrics, and thereby causing improved surface colour definition of the fabric after laundering, particularly after multiple washings. Furthermore, the polymeric materials contained in the compositions need not cause unacceptable dye transfer and/or stain removal problems.

The polymeric material which can be used in the present invention can be any of the polymers or prepolymers derived from polyoxyalkyleneamines that are described in US 5571286, the contents of which are incorporated herein by reference. Methods for preparing the polymeric materials are described in US 5571286. Hence the polymeric material can be, for example, the reaction product of a diamine or triamine polyoxyalkylene polymer having a polymerisation degree of from 4 to 50 or a mixture thereof with epichlorohydrin in a ratio of epichlorohydrin to amino nitrogen of from 1:1 to 3:1.

The amino groups in the polymeric material of the invention may wholly or partly in the form of derivatives of amino groups. Derivatives include, for example, adducts formed by alkylation or hydroxyalkylation at the nitrogen atom or by the formation of an amide group at the nitrogen atom. The derivatives may be formed by the reaction of the amino groups with a bifunctional bridging agent or with a cross-linking agent.

Preferably, the polymeric material is obtainable by the reaction of a polymer of formula $B(R)_n$, wherein n is from 1

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- to 20, B is a backbone group to which each R is covalently bonded and R is a group comprising a poly(oxyalkylene) chain, which chain comprises an amino end group, the polymer being optionally reacted with a bridging compound, with a cross-linking agent. It will thus be appreciated that the polymeric material of the invention is a relatively complex mixture comprising a number of different compounds, some or all of which may be cross-linked.
- The poly(oxyalkylene) chain which forms a part of the R group may be, for example, a poly(oxyethylene), poly(oxybutylene) or poly(oxyprop-1,2-ylene) chain. The length of the chain can vary from 2 to 100 repeat units.
- Conveniently, n is 2 or 3. It will be appreciated that n may not be a whole number where the polymeric material of the invention comprises a mixture of different polymers of formula $B(R)_n$.
- In some of the polymeric materials which may be used in the invention, B is
- $$\begin{array}{c} \text{-O-CH}_2\text{(CH)}_m\text{-CH}_2\text{-O-} \quad (\text{ie, B is the residue of glycerol when m is 1) and m is equal} \\ | \\ \text{O} \\ | \end{array}$$
- to n-2.
- However, B can also represent other values such as , for example, the residue of other triols or the residue of a di-, tetra-, penta- or hexa- hydroxy compound. Alternatively, B can represent the residue of a di-, tri- or poly- amine.

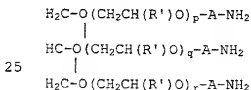
- 7 -

Preferably, at least one R group has the formula -
 $(\text{CH}_2\text{CH}(\text{R}')(\text{CH}_2)_a\text{O})_p\text{-A-NHR}''$, wherein: R' is H or CH_3 ; a is 0,
 1 or 2; p is an integer from 5 to 30; A is an alkylene
 5 group; and R'' is H or alkyl. More preferably, p is from 10
 to 25.

The term "alkyl", as used herein, includes C_1 to C_6 alkyl,
 optionally substituted on the alkyl chain, which may be
 10 branched or unbranched and, for C_3 to C_6 alkyl, may be
 cyclic. The term "alkylene" is defined similarly but refers
 to a divalent radical.

It will be appreciated that the term "end group" refers to
 15 the group at or near to the end of the poly(oxyalkylene)
 chain, which end, when the polymer is of formula $\text{B}(\text{R})_n$, is at
 the other end of the polymer chain from the end which is
 attached to B.

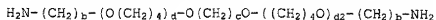
20 Suitable polymers of formula $\text{B}(\text{R})_n$ include those having the
 following structure:



wherein R' is as defined herein before, p, q and r are
 integers which may be the same or different and may be from
 30 5 to 30 and A is branched or unbranched lower alkylene.

- 8 -

Other suitable polymers of formula $B(R)_n$, in which n is equal to 2, include those having the following formula:



wherein: b is an integer from 1 to 6, preferably 3; c is an integer from 1 to 6, preferably 4; and d and d2 are the same or different and are integers from 10 to 15.

The cross-linking agent which is used to form the polymeric material of the invention by reaction with the polymer, or the polymer after prior reaction with the bridging compound, preferably comprises an epihalohydrin. Epichlorohydrin is a suitable epihalohydrin.

Preferably the molar ratio of cross-linking agent to polymer of formula $B(R)_n$ is from 0.5:1 to 4:1. Other amounts of cross-linking agent may be present in the polymeric material of the invention.

Suitable bridging compounds comprise two epoxide or carboxylic acid groups. The epoxide or carboxylic acid groups may be linked by a linker comprising alkylene, arylene, poly(oxyalkylene) or siloxane groups or combinations thereof. Examples of bridging compounds therefore include benzene-1,4-dicarboxylic acid, hexane-1,6-dicarboxylic acid and poly(oxyethylene) compounds terminated at both ends of the molecule by an epoxide group. Other suitable bridging compounds are disclosed in US 5571286.

The composition of the invention can contain the polymeric material, optionally together with other polymeric materials. The compositions may further comprise a silicone

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which is capable of reacting with the polymeric material. Suitable reactive silicones include those having amino or hydroxyl groups which are well-known to those skilled in the art.

5

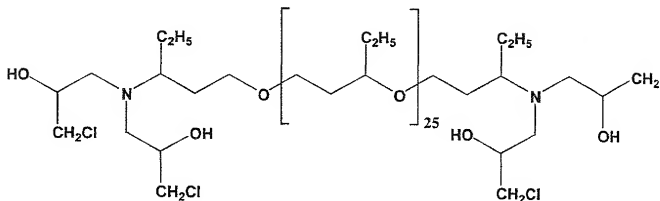
Preferably, the polymeric material is capable of increasing the wet strength of paper by at least 200% compared to untreated paper when applied to paper having a weight of 80 g/m² at a level of 1% solids by weight based on weight of paper, according to the test method described hereinafter.

Polymeric materials which are suitable for use in the present invention are available from Precision Processes Textiles (Ambergate, Derbyshire, UK) under the trade marks

15 POLYMER AM and POLYMER MRSM. The polymeric materials of the invention are preferably in the form of aqueous solutions.

Polymer AM is a polymer having the following structure:

20



POLYMER AM

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Polymer MRSM has the same structures as polymer AM but has silicone added to the polymer mixture.

5

The nature of the textile compatible carrier will be dictated to a large extent by the stage at which the composition of the invention is used in a laundering process, the compositions being capable of being used, in principle, at any stage of the process. For example, where the compositions are for use as main wash detergent compositions, the one or more textile compatible carriers comprise a detergent active compound. Where the compositions are for use in the rinsing step of a laundering process, the one or more textile compatible carriers may comprise a fabric softening and/or conditioning compound.

The compositions of the invention preferably comprise a perfume, such as of the type which is conventionally used in fabric care compositions. The compositions may be packaged and labelled for use in a domestic laundering process.

The polymeric material is preferably present in the product in a sufficient quantity to give an amount of 0.0005% to 5% by weight on the fabric based on the weight of the fabric, more preferably 0.001% to 2% by weight on fabric. The amount of the polymeric material in the composition required to achieve the above % by weight on fabric will typically be in the range 0.01% to 35% by weight, preferably 0.1 to 13.5% by weight.

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The compositions of the invention, when applied to a fabric, can impart benefits to the fabric when uncured. However, they may be cured by a domestic curing step including ironing and/or domestic tumble drying, preferably tumble drying. The curing is preferably carried out at a temperature in the range of from 50 to 100°C, more preferably from 80 to 100°C.

In the context of the present invention the term "textile compatible carrier" is a component which can assist in the interaction of the first component with the fabric. The carrier can also provide benefits in addition to those provided by the first component e.g. softening, cleaning etc. The carrier may be water, in which case the composition of the invention will contain another additive, suitable for use in laundry compositions such as perfume, for example, or the carrier may be a detergent-active compound or a fabric softener or conditioning compound or other suitable detergent or fabric treatment agent.

If the composition of the invention is to be used in a laundry process as part of a conventional fabric treatment product, such as a detergent composition, the textile-compatible carrier will typically be a detergent-active compound. Whereas, if the fabric treatment product is a rinse conditioner, the textile-compatible carrier will be a fabric softening and/or conditioning compound.

If the composition of the invention is to be used before, or after, the laundry process it may be in the form of a spray or foaming product.

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The fabrics which may be treated in the present invention include those which comprise cellulosic fibres, preferably from 1% to 100% cellulosic fibres (more preferably 5% to 100% cellulosic fibres, most preferably 40% to 100%). The fabric may be in the form of a garment, in which case the method of the invention may represent a method of laundering a garment. When the fabric contains less than 100% cellulosic fibres, the balance comprises other fibres or blends of fibres suitable for use in garments such as polyester, for example. Preferably, the cellulosic fibres are of cotton or regenerated cellulose such as viscose.

The laundering processes of the present invention include the large scale and small scale (eg domestic) cleaning of fabrics. Preferably, the processes are domestic.

In the invention, the polymeric material or the composition of the invention may be used at any stage of the laundering process. Preferably, the composition or the polymeric material is used to treat the fabric in the rinse cycle of a laundering process. The rinse cycle preferably follows the treatment of the fabric with a detergent composition.

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Detergent Active Compounds

- If the composition of the present invention is in the form
- 5 of a detergent composition, the textile-compatible carrier may be chosen from soap and non-soap anionic, cationic, nonionic, amphoteric and zwitterionic detergent active compounds, and mixtures thereof.
- 10 Many suitable detergent active compounds are available and are fully described in the literature, for example, in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch.
- 15 The preferred textile-compatible carriers that can be used are soaps and synthetic non-soap anionic and nonionic compounds.
- 20 Anionic surfactants are well-known to those skilled in the art. Examples include alkylbenzene sulphonates, particularly linear alkylbenzene sulphonates having an alkyl chain length of C_8 - C_{15} ; primary and secondary alkylsulphates, particularly C_8 - C_{15} primary alkyl sulphates; alkyl ether sulphates; olefin sulphonates; alkyl xylene sulphonates;
- 25 dialkyl sulphosuccinates; and fatty acid ester sulphonates. Sodium salts are generally preferred.
- Nonionic surfactants that may be used include the primary and secondary alcohol ethoxylates, especially the C_8 - C_{20}
- 30 aliphatic alcohols ethoxylated with an average of from 1 to 20 moles of ethylene oxide per mole of alcohol, and more

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especially the C₁₀-C₁₅ primary and secondary aliphatic alcohols ethoxylated with an average of from 1 to 10 moles of ethylene oxide per mole of alcohol. Non-ethoxylated nonionic surfactants include alkylpolyglycosides, glycerol
5 monoethers, and polyhydroxyamides (glucamide).

Cationic surfactants that may be used include quaternary ammonium salts of the general formula R₁R₂R₃R₄N⁺ X⁻ wherein the R groups are independently hydrocarbyl chains of C₁-C₂₂
10 length, typically alkyl, hydroxyalkyl or ethoxylated alkyl groups, and X is a solubilising cation (for example, compounds in which R₁ is a C₈-C₂₂ alkyl group, preferably a C₈-C₁₀ or C₁₂-C₁₄ alkyl group, R₂ is a methyl group, and R₃ and R₄, which may be the same or different, are methyl or
15 hydroxyethyl groups); and cationic esters (for example, choline esters) and pyridinium salts.

The total quantity of detergent surfactant in the composition is suitably from 0.1 to 60 wt% e.g. 0.5-55 wt%,
20 such as 5-50wt%.

Preferably, the quantity of anionic surfactant (when present) is in the range of from 1 to 50% by weight of the total composition. More preferably, the quantity of anionic
25 surfactant is in the range of from 3 to 35% by weight, e.g. 5 to 30% by weight.

Preferably, the quantity of nonionic surfactant when present is in the range of from 2 to 25% by weight, more preferably
30 from 5 to 20% by weight.

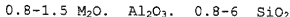
- 15 -

Amphoteric surfactants may also be used, for example amine oxides or betaines.

- 5 The compositions may suitably contain from 10 to 70%, preferably from 15 to 70% by weight, of detergency builder. Preferably, the quantity of builder is in the range of from 15 to 50% by weight.

- 10 The detergent composition may contain as builder a crystalline aluminosilicate, preferably an alkali metal aluminosilicate, more preferably a sodium aluminosilicate.

- The aluminosilicate may generally be incorporated in amounts of from 10 to 70% by weight (anhydrous basis), preferably
15 from 25 to 50%. Aluminosilicates are materials having the general formula:



- 20 where M is a monovalent cation, preferably sodium. These materials contain some bound water and are required to have a calcium ion exchange capacity of at least 50 mg CaO/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO_2 units in the formula above. They can be prepared readily by
25 reaction between sodium silicate and sodium aluminate, as amply described in the literature.

Fabric Softening and/or Conditioner Compounds

- 30 If the composition of the present invention is in the form of a fabric conditioner composition, the textile-compatible

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carrier will be a fabric softening and/or conditioning compound (hereinafter referred to as "fabric softening compound"), which may be a cationic or nonionic compound.

- 5 The softening and/or conditioning compounds may be water insoluble quaternary ammonium compounds. The compounds may be present in amounts of up to 8% by weight (based on the total amount of the composition) in which case the compositions are considered dilute, or at levels from 8% to
10 about 50% by weight, in which case the compositions are considered concentrates.

- Compositions suitable for delivery during the rinse cycle may also be delivered to the fabric in the tumble dryer if
15 used in a suitable form. Thus, another product form is a composition (for example, a paste) suitable for coating onto, and delivery from, a substrate e.g. a flexible sheet or sponge or a suitable dispenser during a tumble dryer cycle.

- 20 Suitable cationic fabric softening compounds are substantially water-insoluble quaternary ammonium materials comprising a single alkyl or alkenyl long chain having an average chain length greater than or equal to C_{20} or, more
25 preferably, compounds comprising a polar head group and two alkyl or alkenyl chains having an average chain length greater than or equal to C_{14} . Preferably the fabric softening compounds have two long chain alkyl or alkenyl chains each having an average chain length greater than or
30 equal to C_{16} . Most preferably at least 50% of the long chain alkyl or alkenyl groups have a chain length of C_{18} or above.

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It is preferred if the long chain alkyl or alkenyl groups of the fabric softening compound are predominantly linear.

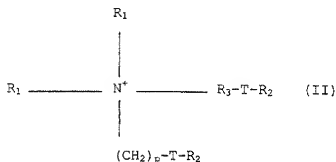
Quaternary ammonium compounds having two long-chain
5 aliphatic groups, for example, distearyldimethyl ammonium chloride and di(hardened tallow alkyl) dimethyl ammonium chloride, are widely used in commercially available rinse conditioner compositions. Other examples of these cationic compounds are to be found in "Surface-Active Agents and
10 Detergents", Volumes I and II, by Schwartz, Perry and Berch. Any of the conventional types of such compounds may be used in the compositions of the present invention.

The fabric softening compounds are preferably compounds that
15 provide excellent softening, and are characterised by a chain melting $L\beta$ to $L\alpha$ transition temperature greater than 25°C , preferably greater than 35°C , most preferably greater than 45°C . This $L\beta$ to $L\alpha$ transition can be measured by DSC as defined in "Handbook of Lipid Bilayers", D Marsh, CRC
20 Press, Boca Raton, Florida, 1990 (pages 137 and 337). Substantially water-insoluble fabric softening compounds are defined as fabric softening compounds having a solubility of less than 1×10^{-3} wt % in demineralised water at 20°C . Preferably the fabric softening compounds have a solubility
25 of less than 1×10^{-4} wt%, more preferably less than 1×10^{-8} to 1×10^{-6} wt%.

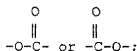
Especially preferred are cationic fabric softening compounds that are water-insoluble quaternary ammonium materials
30 having two C_{12-22} alkyl or alkenyl groups connected to the molecule via at least one ester link, preferably two ester

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links. An especially preferred ester-linked quaternary ammonium material can be represented by the formula II:



wherein each R_1 group is independently selected from C_{1-4} alkyl or hydroxyalkyl groups or C_{2-4} alkenyl groups; each R_2 group is independently selected from C_{8-28} alkyl or alkenyl groups; and wherein R_3 is a linear or branched alkylene group of 1 to 5 carbon atoms, T is

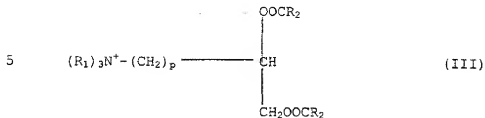


and p is 0 or is an integer from 1 to 5.

Di(tallowoxyloxyethyl) dimethyl ammonium chloride and/or its hardened tallow analogue is especially preferred of the compounds of formula (II).

A second preferred type of quaternary ammonium material can be represented by the formula (III):

- 19 -



10 wherein R_1 , p and R_2 are as defined above.

It is advantageous if the quaternary ammonium material is biologically biodegradable.

15 Preferred materials of this class such as 1,2-bis(hardened tallowoyloxy)-3-trimethylammonium propane chloride and their methods of preparation are, for example, described in US 4 137 180 (Lever Brothers Co). Preferably these materials comprise small amounts of the corresponding
20 monoester as described in US 4 137 180, for example, 1-hardened tallowoyloxy-2-hydroxy-3-trimethylammonium propane chloride.

Other useful cationic softening agents are alkyl pyridinium
25 salts and substituted imidazoline species. Also useful are primary, secondary and tertiary amines and the condensation products of fatty acids with alkylpolyamines.

The compositions may alternatively or additionally contain
30 water-soluble cationic fabric softeners, as described in GB 2 039 556B (Unilever).

- 20 -

The compositions may comprise a cationic fabric softening compound and an oil, for example as disclosed in EP-A-0829531.

- 5 The compositions may alternatively or additionally contain nonionic fabric softening agents such as lanolin and derivatives thereof.

10 Lecithins are also suitable softening compounds.

Nonionic softeners include L β phase forming sugar esters (as described in M Hato et al Langmuir 12, 1659, 1666, (1996)) and related materials such as glycerol monostearate or sorbitan esters. Often these materials are used in
15 conjunction with cationic materials to assist deposition (see, for example, GB 2 202 244). Silicones are used in a similar way as a co-softener with a cationic softener in rinse treatments (see, for example, GB 1 549 180).

20 The compositions may also suitably contain a nonionic stabilising agent. Suitable nonionic stabilising agents are linear C₈ to C₂₂ alcohols alkoxyated with 10 to 20 moles of alkylene oxide, C₁₀ to C₂₀ alcohols, or mixtures thereof.

25 Advantageously the nonionic stabilising agent is a linear C₈ to C₂₂ alcohol alkoxyated with 10 to 20 moles of alkylene oxide. Preferably, the level of nonionic stabiliser is within the range from 0.1 to 10% by weight, more preferably from 0.5 to 5% by weight, most preferably from 1 to 4% by
30 weight. The mole ratio of the quaternary ammonium compound and/or other cationic softening agent to the nonionic

- 21 -

stabilising agent is suitably within the range from 40:1 to about 1:1, preferably within the range from 18:1 to about 3:1.

- 5 The composition can also contain fatty acids, for example C_8 to C_{24} alkyl or alkenyl monocarboxylic acids or polymers thereof. Preferably saturated fatty acids are used, in particular, hardened tallow C_{16} to C_{18} fatty acids. Preferably the fatty acid is non-saponified, more preferably
- 10 the fatty acid is free, for example oleic acid, lauric acid or tallow fatty acid. The level of fatty acid material is preferably more than 0.1% by weight, more preferably more than 0.2% by weight. Concentrated compositions may comprise from 0.5 to 20% by weight of fatty acid, more preferably 1%
- 15 to 10% by weight. The weight ratio of quaternary ammonium material or other cationic softening agent to fatty acid material is preferably from 10:1 to 1:10.

- The fabric conditioning compositions may include silicones,
- 20 such as predominately linear polydialkylsiloxanes, e.g. polydimethylsiloxanes or aminosilicones containing amine-functionalised side chains; soil release polymers such as block copolymers of polyethylene oxide and terephthalate; amphoteric surfactants; smectite type inorganic clays;
- 25 zwitterionic quaternary ammonium compounds; and nonionic surfactants.

- The fabric conditioning compositions may also include an agent which produces a pearlescent appearance, e.g. an
- 30 organic pearlising compound such as ethylene glycol

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distearate, or inorganic pearlising pigments such as microfine mica or titanium dioxide (TiO₂) coated mica.

5 The fabric conditioning compositions may be in the form of emulsions or emulsion precursors thereof.

Other optional ingredients include emulsifiers, electrolytes (for example, sodium chloride or calcium chloride) preferably in the range from 0.01 to 5% by weight, pH buffering agents, and perfumes (preferably from 0.1 to 5% by weight).

Further optional ingredients include non-aqueous solvents, perfume carriers, fluorescers, colourants, hydrotropes, antifoaming agents, antiredeposition agents, enzymes, optical brightening agents, opacifiers, dye transfer inhibitors, anti-shrinking agents, anti-wrinkle agents, anti-spotting agents, germicides, fungicides, anti-oxidants, UV absorbers (sunscreens), heavy metal sequestrants, chlorine scavengers, dye fixatives, anti-corrosion agents, drape imparting agents, antistatic agents and ironing aids. This list is not intended to be exhaustive.

Fabric Treatment Products

25 The composition of the invention may be in the form of a liquid, solid (e.g. powder or tablet), a gel or paste, spray, stick or a foam or mousse. Examples including a soaking product, a rinse treatment (e.g. conditioner or finisher) or a mainwash product. The composition may also be applied to a substrate e.g. a flexible sheet or used in a

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dispenser which can be used in the wash cycle, rinse cycle or during the dryer cycle.

The invention will now be described by way of example only
5 and with reference to the following non-limiting examples.

EXAMPLES

10 POLYMER AM (trade mark) and POLYMER MRSM (trade mark) are polymeric materials according to the invention and were obtained from Precision Processes Textiles of Ambergate, Derbyshire, UK.

15 Test method for assessing wet-strength resins on paper by tensile strength

The test procedure used was as follows:

- 20 Paper selected = 80 gsm White Copier Bond, 210 x 297 mm, Universal Office Supplies ref UCOP80. Dry weight of one A4 sheet = 4.91 g. Weight after 30 minute soak and removal of excess water = 7.30 g. Pick-up therefore set as 50%.
- 25 For the untreated standard, the paper was soaked in deionised water for 10 minutes in a shallow tray. After this time, sheets were removed and the excess water removed by gently patting with paper towels until all surface water had been removed. The paper was then dried at 110°C for 10
30 minutes in a fan-assisted oven.

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For the treated sample, a solution of Polymer AM or Polymer MRSM (trade mark) with water was prepared along with 2 g/l of sodium bicarbonate to provide an application level by pick-up of 1% o.w.f.

5

As with the reference, the treated samples are soaked for 10 minutes in the solution, the excess water removed and then dried/cured as above.

10 The paper is then allowed to stand for at least 24 hours (as the tensile strength measurements are carried out on saturated paper, it is not necessary to condition the paper at 65% RH).

15 The samples are cut using a guillotine to 270 mm by 67 mm, and lines are drawn parallel to the smaller length 35 mm in to act as a guide when clamping the sample into the Testometric jaws.

20 The samples are then soaked in deionised water for 30 minutes.

After this time, the majority of the water is drained away to leave the paper saturated while measurements are made.

25 Prior to the test being performed, the excess water is removed as before.

Testometric set-up - 25 kgf load cell, 100 mm/min speed, pre-tension 0.1 kgf, sample length 200 mm, sample width 67

30 mm.

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The results of the tests were as follows:

Sample treatment	Wet strength (kgf)
Untreated paper	1.069
Polymer AM	4.920
Polymer MRSM	4.017

Example 1

5 Dye transfer inhibition

- Five applications of 0.2% Kenores 1440 (trade mark) polyamine-epichlorohydrin (PAE) resin (Akzo Nobel) as disclosed in WO 97/42287 (a polymer outside the scope of this invention) were made via a domestic washing machine (Zanussi (trade mark) automatic washing machine, 40°C cotton wash cycle, Persil (trade mark) applied during the wash cycle) to white woven cotton sheeting, a theoretical maximum application of 1.0% by weight PAE on weight of fabric (owf).
- 15 A similar process was carried out using 0.2% Polymer AM (trade mark) and 0.2% Polymer MRSM (trade mark). The treated fabrics were then washed with Direct Red 80 dyed fabric which is known to lose dye. The resulting fabrics were then measured on a Spectroflash (trade mark) spectrometer to determine the degree of dye transfer. A blank fabric sample was used as reference.
- 20

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	ΔL	ΔE
0.2% Kenores 1440	-3.47	6.20
0.1% Kenores 1440	-1.05	2.32
Polymer AM	0.93	2.21
Polymer MRSM	0.28	1.47

ΔL = change in lightness

ΔE = change in colour

- 5 Thus, there is less change in colour for the fabric treated with a polymer according to the invention and, therefore, less dye transfer.

Example 2

10 **Garment Care Properties**

- Spectroflash (trade mark) measurements on a standard test fabric having black and red regions show that the fabrics treated with Polymer AM (trade mark) and Polymer MRSM (trade
15 mark) according to Example 1 display reduced damage.

Black area:

	ΔL	ΔE
Untreated	9.94	10.07
Polymer AM	1.81	1.95
Polymer MRSM	3.00	3.09

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Red area:

	ΔL	ΔE
Untreated	3.30	12.62
Polymer AM	1.20	5.39
Polymer MRSM	1.19	4.84

5 In both cases, the treated areas show less change in shade than the untreated sample, indicated by the smaller ΔL and ΔE values.

Example 3

Stain removal

10

1 ml of red wine was applied to treated cotton according to the procedure set out in Example 1 (5 rinse applications of 0.2% per wash). The stain was measured on a Spectroflash (trade mark) spectrophotometer prior to washing and after
15 washing at 40°C using Persil Performance Biological (trade mark) powder. The change in depth of colour on the stains relative to the sample before washing was:

	ΔL	ΔE
Untreated	-17.93	22.10
Polymer AM	-20.26	23.98
Polymer MRSM	-23.36	26.37
Kenores 1440	-19.38	22.37

20 After washing, the colour measurements were:

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	ΔL	ΔE
Untreated	-3.97	5.94
Polymer AM	-3.65	5.10
Polymer MRSM	-5.70	7.98
Kenores 1440	-8.42	10.45

Polymer AM (trade mark) shows almost identical stain release properties to untreated fabric, whereas Polymer MRSM (trade mark) falls between Polymer Am (trade mark) and Kenores 1440 (trade mark).

The background area of the fabric was also measured to provide an indication of any tendency of the treatments to cause soil redeposition. The smaller the spectrometer reading, the less the change in colour and the less soil redeposition.

	ΔL
Untreated	-0.20
Polymer AM	-0.02
Polymer MRSM	-0.19
Kenores 1440	-0.27
Standard rinse conditioner*	-0.05

*Comfort (trade mark) (Unilever plc, UK)

Although the differences are small, there are still indications that these polymers do not increase the soil redeposition properties of the fabric to the same extent that PAE-type polymers do. In the case of Polymer AM (trade

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mark), there is less redeposition than with the rinse conditioner.

Example 4

5 **Fabric Conditioner Formulation**

Fabric conditioner formulations were made by preparing a standard fabric conditioner composition containing components 2 to 8 below and adding component 1 to it, with stirring. Compositions were prepared in both dilute and concentrated forms.

The formulations were as follows:

	Dilute	Concentrate
1. Polymer AM	15.1%	48.7%
2. Water	80.04%	35.86%
3. Antifoam	0.01%	0.03%
4. Genapol*	0.25%	0.75%
5. HEQ	4.20%	13.5%
6. Preservative	0.03%	0.06%
7. Dye	0.07%	0.15%
8. Perfume	0.30%	0.95%

*a C₁₂ primary alcohol ethoxylated with 20 moles of ethylene oxide

Example 5

20 Polymer AM was pad applied to 2% resinated cotton poplin monitors (40x40cm) to give a pick-up lever of 0.5% owf on the fabric. The monitors were then tumble dried. This was

- 30 -

carried out four times to give a total level of 2% owf. A similar procedure was carried out for Polymer MRSM and Kenores 1440. The monitors were wetted, scrunched (to simulate creasing in the wash process) then placed in a domestic tumble drier (Miele) with wetted cotton sheeting ballast (1 Kg when dry). The load was then dried until the anti-crease setting on the drier was attained. The monitors were then panelled against AATCC smoothness standards to determine the level of creasing. The monitors were then ironed and the crease process repeated

Polymer	0.5% owf (before ironing)	0.5% owf (after ironing)	2% owf (before ironing)	2% owf (after ironing)
Untreated control	1.4	1.38	1.64	1.54
PAE	1.3	1.44	2.26	1.94
Kenores 1440	2.28	2.06	2.3	2.52
Polymer MRSM	2.1	2.34	2.38	2.8

Polymer AM and Polymer MRSM are considerably less creased than the untreated control. Polymer MRSM treated monitors become even less creased if an ironing step is included.

Polymer AM and Polymer MRSM are considerably less creased than Kenores 1440 especially at the 0.5% owf level.

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Claims

1. Fabric care composition comprising a polymeric material which is capable of self cross-linking and/or of reacting
 5 with cellulose together with one or more textile compatible carriers, wherein the polymeric material comprises one or more poly(oxyalkylene) groups having an end group which comprises one or more amino groups or derivatives of said amino groups, wherein when the textile compatible carrier is
 10 water a further additive suitable for use in laundry compositions is present.

2. Composition as claimed in Claim 1, wherein the polymeric material is obtainable by the reaction of a
 15 polymer of formula $B(R)_n$, wherein n is from 1 to 20, B is a backbone group to which each R is covalently bonded and R is a group comprising a poly(oxyalkylene) chain, which chain comprises an amino end group, the polymer being optionally reacted with a bridging compound, with a cross-linking
 20 agent.

3. Composition as claimed in Claim 2, wherein n is 2 or 3.

4. Composition as claimed in Claim 2 or Claim 3, wherein B
 25 is $-O-CH_2 (CH)_m-CH_2-O-$ and m is equal to n-2.



30 5. Composition as claimed in any one of Claims 2 to 4, wherein at least one R group has the formula -
 $(CH_2CH(R')(CH_2)_aO)_p-A-NHR''$, wherein: R' is H or CH_3 ; a is 0,

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1 or 2; p is an integer from 5 to 30; A is an alkylene group; and R'' is H or alkyl.

- 5 6. Composition as claimed in any one of Claims 2 to 5, wherein p is from 10 to 25.

7. Composition as claimed in any one of Claims 2 to 6, wherein the polymer of formula B(R)_n is
- 10
$$\begin{array}{c} \text{H}_2\text{C}-\text{O}(\text{CH}_2\text{CH}(\text{R}')\text{O})_p-\text{A}-\text{NH}_2 \\ | \\ \text{HC}-\text{O}(\text{CH}_2\text{CH}(\text{R}')\text{O})_q-\text{A}-\text{NH}_2 \\ | \\ \text{H}_2\text{C}-\text{O}(\text{CH}_2\text{CH}(\text{R}')\text{O})_r-\text{A}-\text{NH}_2 \end{array}$$
- 15

wherein p, q and r are integers which may be the same or different and may be from 5 to 30 and A is branched or unbranched lower alkylene.

- 20 8. Composition as claimed in any one of Claims 2 to 6, wherein the polymer of formula B(R)_n is
- $$\text{H}_2\text{N}-(\text{CH}_2)_b-(\text{O}(\text{CH}_2)_4)_d-\text{O}(\text{CH}_2)_c\text{O}-((\text{CH}_2)_4\text{O})_{d2}-(\text{CH}_2)_b-\text{NH}_2$$
- wherein: b is an integer from 1 to 6; c is an integer from 1 to 6; and d and d2 are the same or different and are
- 25 integers from 10 to 15.

9. Composition as claimed in Claim 8, wherein b is 3 and/or c is 4.

- 30 10. Composition as claimed in any one of Claims 2 to 9, wherein the cross-linking agent comprises an epihalohydrin.

- 33 -

11. Composition as claimed in any one of Claims 2 to 10 wherein the molar ratio of cross-linking agent to polymer of formula $B(R)_n$ is from 0.5:1 to 4:1.
- 5 12. Composition as claimed in any one of Claims 2 to 11, wherein the bridging compound comprises two epoxide or carboxylic acid groups.
- 10 13. Composition as claimed in Claim 11, wherein the epoxide or carboxylic acid groups are linked by a linker comprising alkylene, arylene, poly(oxyalkylene) or siloxane groups or combinations thereof.
- 15 14. Composition as claimed in any one of Claims 1 to 13 further comprising a silicone which is capable of reacting with the polymeric material.
- 20 15. Composition as claimed in any one of Claims 1 to 14, wherein the polymeric material is capable of increasing the wet strength of paper by at least 200% compared to untreated paper when applied to paper having a weight of 80 g/m² at a level of 1% solids by weight based on weight of paper.
- 25 16. Composition as claimed in any one of Claims 1 to 15, wherein the one or more textile compatible carriers comprise a detergent active compound.
- 30 17. Composition as claimed in any one of Claims 1 to 15, wherein the one or more textile compatible carriers comprise a fabric softening and/or conditioning compound.

- 34 -

18. Composition as claimed in any one of Claims 1 to 17, further comprising a perfume.

19. A method of treating fabric, as part of a laundering
5 process, which comprises applying to the fabric a fabric care composition according to any one of Claims 1 to 18.

20. A method of treating fabric, as part of a laundering
10 process, which comprises applying to the fabric a polymeric material as defined in any one of Claims 1 to 18.

21. A method as claimed in Claim 19 or Claim 20 wherein the composition is applied to the fabric during a wash cycle.

15 22. A method as claimed in Claim 19, or Claim 20, wherein the composition is applied to the fabric during a rinse cycle.

23. Use of a fabric care composition according to any one
20 of Claims 1 to 18 or a polymeric material as defined in any one of Claims 1 to 18 to improve the surface colour definition of a fabric after multiple washings.

24. Use of a fabric care composition according to any one
25 of Claims 1 to 18 or a polymeric material as defined in any one of Claims 1 to 18 to impart pill and/or fuzz resistance to fabric during laundering.

25. Use as claimed in Claim 23 or Claim 24, wherein the
30 fabric comprises cellulosic fibres.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C11D3/37

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C11D C08G D06M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 92 07132 A (PRECISION PROC TEXTILES LTD) 30 April 1992 (1992-04-30) page 10, line 1 - line 16; claims 1,6,12; example 3	1-6, 8-17, 19-22, 24,25
X	US 5 571 286 A (CONNELL DAVID L ET AL) 5 November 1996 (1996-11-05) cited in the application column 3, line 29 - column 6, line 9; examples 1-4; table III column 7, line 20 - line 42	1-14
X	US 3 753 931 A (RASPANTI G) 21 August 1973 (1973-08-21) column 5, line 26 - line 30; example 1 -/-	1-6,8-13



Further documents are listed in the continuation of box C



Patent family members are listed in annex.

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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/GB 00/03695

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 29530 A (PROCTER & GAMBLE) 9 July 1998 (1998-07-09) cited in the application abstract; examples page 12, paragraph 4 -page 13, paragraph 2 -----	1,2, 10-12, 16-25

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/GB 00/03695

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(54) Title: WRINKLE RESISTANT COMPOSITION

(57) Abstract: There is provided a composition comprising a lubricant, preferably a water-soluble one, and components having a deviation of fabric wrinkle recovery angle versus water of at least +15, whereby the combination imparts in-wear wrinkle resistance to the fabric treated therewith.

WO 01/31112 A2

WRINKLE RESISTANT COMPOSITION

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10

Technical field of the invention

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The present invention relates to fabric care compositions and to a method for treating fabrics in order to improve various properties of fabrics, in particular in-wear wrinkle resistance.

20

Background of the invention

25 Wrinkles in textile fabrics are caused by the bending and creasing of the textile material which places an external portion of a filament in a yarn under tension while the internal portion of that filament in the yarn is placed under compression. Particularly with cotton fabrics, the hydrogen bonding that occurs between the cellulose molecules contributes to keeping wrinkles in place. The wrinkling of
30 fabric, in particular clothing, is therefore subject to the inherent tensional elastic deformation and recovery properties of the fibers which constitute the yarn and fabrics.

35 In the modern world, with the increase of hustle and bustle and travel, there is a demand for a quick fix which will help to diminish the labor involved in home laundering and/or the cost and time involved in dry cleaning or commercial

laundrying. Further, it is well-known that alternating cycles of using and laundrying fabrics and textiles, such as articles of worn clothing and apparel, will inevitably adversely affect the appearance and integrity of the fabric and textile items so used and laundryed. Fabrics and textiles simply wear out over time and with use. Laundrying of fabrics and textiles is necessary to remove soils and stains which accumulate therein and thereon during ordinary use. However, the laundrying operation itself, over many cycles, can accentuate and contribute to the deterioration of the integrity and the appearance of such fabrics and textiles. Accordingly, this has brought additional pressure to bear on textile technologists to produce a product that will sufficiently reduce wrinkles in fabrics, especially clothing, whilst still producing a good appearance through a simple, convenient application of a product.

The prior art contains numerous examples of compositions for reducing wrinkles. U.S. 5,532,023, discloses aqueous wrinkle control compositions containing non-volatile silicone and film-forming polymer. Preferred silicones include reactive silicones and amino-functional silicone, known as "amodimethicone". The composition containing such silicones is applied to fabric from a spray dispenser. It is found that in the spray treatment, an appreciable amount of the aqueous composition misses the fabric, and instead falls on flooring surfaces, such as rugs, carpets, concrete floors, tiled floors, linoleum floors, bathtub floors, which leaves a silicone layer that is accumulated on and/or cured on and/or bonded to the flooring surfaces. Such silicones that are accumulated on such surfaces, and especially those that are bonded to such surfaces are difficult to remove. Flooring surfaces thus become slippery and can present a safety hazard to the household members. U.S. 5,573,695 discloses an aqueous wrinkle removal composition containing a vegetable oil based cationic quaternary ammonium surfactant, and an anionic fluorosurfactant. Similarly, U.S. 4,661,268 discloses a wrinkle removal spray comprising an aqueous alcoholic composition containing a dialkyl quaternary ammonium salt and a silicone surfactant and/or a fluoro surfactant. U.S. 5,100,566 discloses a method of reducing wrinkles in fabric by spraying the fabric with an aqueous alcoholic solution of an anionic siliconeate alkali metal salt. U.S. 4,806,254 discloses fabric wrinkle removal aqueous alcoholic solution containing glycerine and a nonionic surfactant. WO98/04772 provides the treatment of fabric against fabric creasing by application of a composition comprising a polycarboxylic acid or derivative thereof; and then

curing the composition using a domestic process. Starch is also a conventional ingredient of dewrinkling compositions. However, while starch provides a suitable visual benefit onto the treated fabrics, it also gives fabric with an undesired stiff or starchy feeling. These patents are incorporated herein by reference.

5

Accordingly, the domestic treatment of fabric is a problem known in the art to the formulator of laundry compositions. Therefore, there is a need for a wrinkle reducing composition which reduces the above mentioned negatives.

10 Further, most of the focus in the dewrinkling area has been on providing compositions with instant dewrinkling. However, with the current trends of reducing the labor involved in ironing, it has now been found that there is a need for a composition that would additionally provide in-wear wrinkle resistance, i.e. a composition that would provide long-lasting benefit upon ironing, and wearing.

15

Moreover, there is also a need for an efficient and economical composition.

It has now surprisingly been found that the combination of a lubricant, preferably a water-soluble one, and component having a deviation of fabric Wrinkle
20 Recovery Angle (WRA) versus water of at least +15 fulfill such a need. This finding is particularly surprising, especially when the component providing such deviation is a polymer. Indeed, It is known that the combination of a lubricant, especially a water-soluble one, with polymer is often the cause of phase separation. Further, often the addition of polymer like starch on top of
25 composition comprising a lubricant, preferably a water-soluble one, was found to give even worse results on the in-wear performance. Surprisingly, it has been found that the addition of a component providing a deviation of fabric WRA of at least +15 overcome such problems.

30 Accordingly, the present invention reduces wrinkles in fabrics, including clothing, dry cleanables, linens, bed clothes, and draperies, by ironing. The present invention can be used on damp or dry clothing to relax wrinkles and give clothes a ready to wear look with lasting benefits that is demanded by today's fast paced world.

35

In a preferred aspect, an additional benefit of the composition of the present invention is an improved garment shape, body and crispness.

- 5 The composition of the present invention acts as an excellent ironing aid. The present invention makes the task of ironing easier and faster by creating less iron drag. The compositions of the present invention help produce a crisp, smooth appearance.

Summary of the invention

10

The present invention is a wrinkle reducing composition comprising a lubricant, preferably a water-soluble one, and a component having a deviation of fabric Wrinkle Recovery angle (WRA) versus water of at least +15.

15

In another aspect of the invention, there is provided an article of manufacture comprising the composition of the invention, such as a sprayer, an aerosol, a foam dispenser, an iron, a refill cartridge thereof which contains the composition.

- 20 Still in a further aspect of the invention, there is provided a method of treating fabrics for imparting benefits selected from the group consisting of: reducing wrinkles and imparting in-wear resistance to fabrics. In a preferred method, the composition is sprayed onto a fabric and the fabric is ironed.

- 25 In a further aspect of the invention, there is provided an article of manufacture comprising a container and the composition of the invention in association with usage instructions, in particular, instructions to use in a method where the composition is sprayed onto the fabric and the fabric is ironed.

30

Detailed description of the invention

1)- lubricant:

- 35 One essential component of the invention is a lubricant, preferably a water-soluble one. By means of this component, the composition provides an ease of

ironing whilst still avoiding the staining of fabric and/or presenting safety hazard to the household members.

- For the purposes of the present invention the term "water-soluble" is defined as
 5 "a component which when dissolved in water at a level of 0.2% by weight, or less, at 25° C, forms a clear, isotropic liquid".

Typical water-soluble lubricants include components selected from nonionic
 silicone containing surfactants, sorbitan esters, ethoxylated sorbitan esters, and
 10 mixtures thereof. The water-soluble lubricants are preferably present in an amount of from 0.1% to 70% by weight of the composition, more preferably of from 1 to 10% % by weight of the composition for diluted composition and of from 20 to 50% by weight of the composition for concentrated compositions.

- 15 A preferred class of nonionic silicone containing surfactants are the polyalkylene oxide polysiloxanes having a dimethyl polysiloxane hydrophobic moiety and one or more hydrophilic polyalkylene side chains, and having the general formula:

$$R1-(CH_3)_2SiO-[(CH_3)_2SiO]_a-[(CH_3)(R1)SiO]_b-Si(CH_3)_2-R1$$

 wherein a + b are from about 1 to about 50, preferably from about 1 to about 30,
 20 more preferably from about 1 to about 25, and each R1 is the same or different and is selected from the group consisting of methyl and a poly(ethyleneoxide/propyleneoxide) copolymer group having the general formula:

$$-(CH_2)_n O(C_2 H_4 O)_c (C_3 H_6 O)_d R2$$

 with at least one R1 being a poly(ethyleneoxy/propyleneoxy) copolymer group,
 25 and wherein n is 3 or 4, preferably 3; total c (for all polyalkyleneoxy side groups) has a value of from 1 to about 100, preferably from about 6 to about 100; total d is from 0 to about 14, preferably from 0 to about 3; and more preferably d is 0; total c+d has a value of from about 5 to about 150, preferably from about 7 to about 100 and each R2 is the same or different and is selected from the group
 30 consisting of hydrogen, an alkyl having 1 to 4 carbon atoms, and an acetyl group, preferably hydrogen and methyl group. Each polyalkylene oxide polysiloxane has at least one R1 group being a poly(ethyleneoxide/propyleneoxide) copolymer group.

- 35 Nonlimiting examples of this type of surfactants are the Silwet® surfactants which are available OSI Specialties Inc., a Division of Witco, Danbury, Connecticut.

Representative Silwet® surfactants which contain only ethyleneoxy (C₂H₄O) groups are as follows.

	Name	Average MW	Average a+b	Average total c
	L-7608	600	1	8
5	L-7607	1,000	2	17
	L-77	600	1	9
	L-7605	6,000	20	99
	L-7604	4,000	21	53
	L-7600	4,000	11	68
10	L-7657	5,000	20	76
	L-7602	3,000	20	29
	L-7622	10,000	88	75

Nonlimiting examples of Silwet® surfactants which contain both ethyleneoxy (C₂H₄O) and propyleneoxy (C₃H₆O) groups are as follows.

	Name	Average MW	EO/PO ratio
	L-720	12,000	50/50
	L-7001	20,000	40/60
	L-7002	8,000	50/50
20	L-7210	13,000	20/80
	L-7200	19,000	75/25
	L-7220	17,000	20/80

The molecular weight of the polyalkyleneoxy group (R₁) is less than or equal to about 10,000. Preferably, the molecular weight of the polyalkyleneoxy group is less than or equal to about 8,000, and most preferably ranges from about 300 to about 5,000. Thus, the values of c and d can be those numbers which provide molecular weights within these ranges. However, the number of ethyleneoxy units (-C₂H₄O) in the polyether chain (R₁) must be sufficient to render the polyalkylene oxide polysiloxane water-soluble. If propyleneoxy groups are present in the polyalkyleneoxy chain, they can be distributed randomly in the chain or exist as blocks. Mixtures of Silwet® surfactants which contain both ethyleneoxy and propyleneoxy groups, are also preferred. Preferred Silwet® surfactants are the L-7001, L-7087, L-7200, L-7280, L-7600, L-7608, L-7622, L-7657.

The preparation of polyalkylene oxide polysiloxanes is well-known in the art. Polyalkylene oxide polysiloxanes of the present invention can be prepared according to the procedure set forth in U.S. Pat. No. 3,299,112, incorporated herein by reference. Typically, polyalkylene oxide polysiloxanes of the surfactant blend of the present invention are readily prepared by an addition reaction between a hydrosiloxane (i.e., a siloxane containing silicon-bonded hydrogen) and an alkenyl ether (e.g., a vinyl, allyl, or methallyl ether) of an alkoxy or hydroxy end-blocked polyalkylene oxide). The reaction conditions employed in addition reactions of this type are well-known in the art and in general involve heating the reactants (e.g., at a temperature of from about 85°C to 110°C) in the presence of a platinum catalyst (e.g., chloroplatinic acid) and a solvent (e.g., toluene). Still other preferred water-soluble lubricants of the nonionic type are those from the class of sorbitan esters and/or alkylethoxylate sorbitan ester. These ethoxylated sorbitan esters are formed by ethoxylation of sorbitan or its cyclic derivative sorbitan, followed by esterification of one of the available hydroxy groups to introduce one long chain alkyl or alkenyl group, leaving the remaining hydroxy groups free. Compounds of this type are included in the range commercially available under the Registered Trade Mark TWEEN from Aldrich and from ICI United States Inc, but are also available from other suppliers e.g Radasurf 7137 (Polyethoxylated (20 moles) sorbitan monolaurate), Radasurf 7147 (Polysorbate 60), Radasurf 7157 (Polysorbate 80) commercially available from FINA and Tween 65 (Polyethoxylated (20 moles) sorbitan tristearate), Tween 20 (Polyethoxylated (20 moles) sorbitan monolaurate, Tween 21 (Polyethoxylated (4 moles) sorbitan monolaurate), Tween 40 (Polyethoxylated (20 moles) sorbitan palmitate), commercially available from Aldrich.

Water-insoluble lubricants are also useful herein. Suitable water-insoluble lubricants include cationic fabric softeners, silicones, and aliphatic and cycloaliphatic hydrocarbons.

30

Suitable cationic fabric softening components for use herein include the water-insoluble quaternary-ammonium fabric softeners, the most commonly used having been di-long alkyl chain ammonium chloride or methyl sulfate.

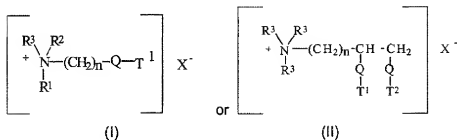
Preferred cationic softeners among these include the following:

- 35 1) ditallow dimethylammonium chloride (DTDMAC);
- 2) dihydrogenated tallow dimethylammonium chloride;

- 3) dihydrogenated tallow dimethylammonium methylsulfate;
 - 4) distearyl dimethylammonium chloride;
 - 5) dioleyl dimethylammonium chloride;
 - 6) dipalmityl hydroxyethyl methylammonium chloride;
 - 5 7) stearyl benzyl dimethylammonium chloride;
 - 8) tallow trimethylammonium chloride;
 - 9) hydrogenated tallow trimethylammonium chloride;
 - 10) C₁₂₋₁₄ alkyl hydroxyethyl dimethylammonium chloride;
 - 11) C₁₂₋₁₈ alkyl dihydroxyethyl methylammonium chloride;
 - 12) di(stearoyloxyethyl) dimethylammonium chloride (DSOEDMAC);
 - 13) di(tallowoyloxyethyl) dimethylammonium chloride;
 - 14) ditallow imidazolinium methylsulfate;
 - 15) 1-(2-tallowylamidoethyl)-2-tallowyl imidazolinium methylsulfate.
- 15 However, in recent years, the need has arisen for more environmentally-friendly materials, and rapidly biodegradable quaternary ammonium compounds have been presented as alternatives to the traditionally used di-long alkyl chain ammonium chlorides and methyl sulfates. Such quaternary ammonium compounds contain long chain alk(en)yl groups interrupted by functional groups
- 20 such as carboxy groups. Said materials and fabric softening compositions containing them are disclosed in numerous publications such as EP-A-0,040,562, and EP-A-0,239,910.

The quaternary ammonium compounds and amine precursors herein have the

25 formula (I) or (II), below :



- 30 wherein Q is selected from -O-C(O)-, -C(O)-O-, -O-C(O)-O-, -NR⁴-C(O)-, -C(O)-NR⁴-;
- R¹ is (CH₂)_n-Q-T² or T³;

R^2 is $(CH_2)_m-Q-T^4$ or T^5 or R^3 ;

R^3 is C_1-C_4 alkyl or C_1-C_4 hydroxyalkyl or H;

R^4 is H or C_1-C_4 alkyl or C_1-C_4 hydroxyalkyl;

T^1, T^2, T^3, T^4, T^5 are independently C_6-C_{22} alkyl or alkenyl;

5 n and m are integers from 1 to 4; and

X^- is a softener-compatible anion.

Non-limiting examples of softener-compatible anions include chloride or methyl sulfate.

10

The alkyl, or alkenyl, chain T^1, T^2, T^3, T^4, T^5 must contain at least 6 carbon atoms, preferably at least 11 carbon atoms, more preferably at least 16 carbon atoms. The chain may be straight or branched.

15 Tallow is a convenient and inexpensive source of long chain alkyl and alkenyl material. The compounds wherein T^1, T^2, T^3, T^4, T^5 represents the mixture of long chain materials typical for tallow are particularly preferred.

Specific examples of quaternary ammonium compounds suitable for use in the aqueous fabric softening compositions herein include :

- 20 1) N,N-di(tallowoyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;
- 2) N,N-di(tallowoyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium methyl sulfate;
- 3) N,N-di(2-tallowoyl-oxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
- 4) N,N-di(2-tallowoyl-oxy-ethylcarbonyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;
- 25 5) N-(2-tallowoyl-oxy-2-ethyl)-N-(2-tallowoyl-oxy-2-oxo-ethyl)-N,N-dimethyl ammonium chloride;
- 6) N,N,N-tri(tallowoyl-oxy-ethyl)-N-methyl ammonium chloride;
- 7) N-(2-tallowoyl-oxy-2-oxo-ethyl)-N-(tallowoyl-N,N-dimethyl-ammonium chloride;
- 30 and
- 8) 1,2-ditallowoyl-oxy-3-trimethylammoniopropane chloride;
- and mixtures of any of the above materials.

Of these, compounds 1-7 are examples of compounds of Formula (I); compound

35 8 is a compound of Formula (II).

Particularly preferred is N,N-di(tallowoyl-oxy-ethyl)-N,N-dimethyl ammonium chloride, where the tallow chains are at least partially unsaturated.

The level of unsaturation of the tallow chain can be measured by the Iodine Value (IV) of the corresponding fatty acid, which in the present case should preferably be in the range of from 5 to 100 with two categories of compounds being distinguished, having a IV below or above 25.

Indeed, for compounds of Formula (I) made from tallow fatty acids having a IV of from 5 to 25, preferably 15 to 20, it has been found that a cis/trans isomer weight ratio greater than 30/70, preferably greater than 50/50 and more preferably greater than 70/30 provides optimal concentrability.

For compounds of Formula (I) made from tallow fatty acids having a IV of above 25, the ratio of cis to trans isomers has been found to be less critical unless very high concentrations are needed.

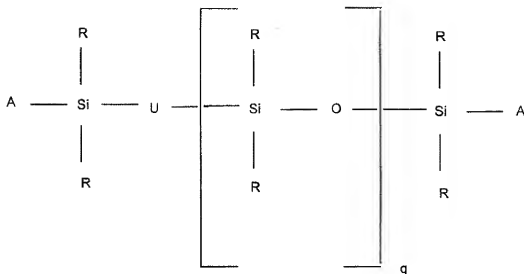
Other examples of suitable quaternary ammoniums of Formula (I) and (II) are obtained by, e.g. :

- replacing "tallow" in the above compounds with, for example, coco, palm, lauryl, oleyl, ricinoleyl, stearyl, palmityl, or the like, said fatty acyl chains being either fully saturated, or preferably at least partly unsaturated;
- replacing "methyl" in the above compounds with ethyl, ethoxy, propyl, propoxy, isopropyl, butyl, isobutyl or t-butyl;
- replacing "chloride" in the above compounds with bromide, methylsulfate, formate, sulfate, nitrate, and the like.

In fact, the anion is merely present as a counterion of the positively charged quaternary ammonium compounds. The nature of the counterion is not critical at all to the practice of the present invention. The scope of this invention is not considered limited to any particular anion.

By "amine precursors thereof" is meant the secondary or tertiary amines corresponding to the above quaternary ammonium compounds, said amines being substantially protonated in the present compositions due to the pH values.

Still other water-insoluble lubricants include polyalkyl or polyaryl siloxanes with the following structure:



The alkyl or aryl groups substituted on the siloxane chain (R) or at the ends of the siloxane chains (A) can have any structure as long as the resulting silicones remain fluid at room temperature. Preferably, the silicones are hydrophobic, are neither irritating, toxic, nor otherwise harmful when applied to fabrics or when they come in contact with human skin, are compatible with other components of the composition, are chemically stable under normal use and storage conditions, and are capable of being deposited on fabric.

The R group preferably is a phenyl, a hydroxy, an alkyl or an aryl. The two R groups on the silicone atom can represent the same group or different groups. More preferably, the two R groups represent the same group preferably a methyl, an ethyl, a propyl, a phenyl or a hydroxy group, q is preferably an integer from about 7 to about 8,000.

"A" represents groups which block the ends of the silicone chains. Suitable A groups include hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and aryloxy. The preferred siloxanes are polydimethyl siloxanes; more preferred siloxanes are polydimethyl siloxanes having a viscosity of greater than about 10 000 centistokes (cst) at 25°C.

Suitable methods for preparing these silicone materials are disclosed in U.S. Pat. Nos. 2,826,551 and 3,964,500, incorporated herein by reference.

Silicones useful in the present invention are also commercially available. Suitable examples include silicones offered by Dow Corning Corporation.

Still other water-insoluble lubricants for use herein are hydrocarbons.

- 5 Suitable hydrocarbons for use herein include, in particular, linear or branched C₈-C₄₀ paraffin hydrocarbons or mixtures of different hydrocarbons. An important factor in the selection of suitable hydrocarbons is that they should have a liquid to at most wax-like consistency at room temperature.

10 **2)-component having a deviation of fabric WRA versus water of at least +15**

;

- A component having a deviation of fabric WRA of at least +15 is another essential component of the invention. Typically, these components are present in
15 an amount of at least about 0.01%, preferably from about 0.1% to about 20% by weight of the composition, preferably to about 4% by weight of the diluted composition, preferably to about 12% by weight of the concentrated composition.

- The WRA Test method is taken from the AATCC 66-1990. This method is an
20 American National Standard method designed for the determination of the wrinkle recovery of woven fabrics, whereby a test specimen, creased and compressed under controlled conditions of time and load, is suspended in the test instrument for a controlled recovery period, after which the recovery angle is measured. Experimental detail on how to measure this WRA is given in AATCC
25 66-1990, incorporated herein by reference. The WRA method is tested on 100% cotton, woven Oxford pinpoint fabric, free from wrinkles, cut in twelve specimens of 0.59 inch x 1.57 inch, six with their long dimension parallel to the warp, and six with their long dimensional parallel to the filling. The test is carried out on cloth conditioned for 24 hours at 21°C (70°F) and 65% RH. Three specimens
30 from each set are creased on one side and three on the other. Tweezers are used to place the test specimen between the leaves of the specimen holder (2 superimposed leaves 0.63 inch wide, but of different lengths and fastened together at one end) with one end directly under the 0.71-inch mark. With the tweezers, the exposed end of the specimen is lifted over and looped back to the
35 0.71-inch mark on the shorter, thin metal leaf and held with the left thumbnail. The holder with the specimen is inserted into a plastic press (2 superimposed

- leaves of equal length (3.74 inch) and 0.79 inch wide, fastened together at one end) and a weight of 500g is applied for 5 minutes so that a crease is formed. The plastic press can then be removed and the specimen holder combination can be inserted in the tester with the exposed end of the specimen holder in the mount on the face of the tester. The crease should line up with a spot at the center of the tester disk, and the dangling specimen leg should be lined up immediately with the vertical guide line. In order to eliminate gravitation effects, keep the dangling specimen leg aligned with the vertical guide line during the 5-min recovery period. Adjust every 15 seconds for the first minute, and once a minute thereafter. Five minutes after the removal of the creasing load, the wrinkle recovery value is read to the nearest degree from the scale. The sum is taken of the average recovery for all warp readings and all filling readings and compared with a cloth treated with water.
- Components defined by their WRA are well-known in the art. For example, in JAPS, Vol.15, pp.341-349 (1971) as well as in Textile Research Journal, pp. 199-201, Feb.1970, are given various examples of components defined by a WRA, all of which are included within the scope of the present invention.
- The fabric WRA obtained with the tested component is compared with the fabric WRA obtained with water, thereby giving a deviation Δ . A component which provide a Δ of at least positive(+)15, preferably having a Δ within the range of 15-30 is a component suitable for the invention.
- The following represents the WRA deviation versus water of different polymers suitable for use in the present invention and according to the above procedure. In each case, numbers are arithmetic averages of 9 replicates and the results are statistically significantly different at 95% confidence level:

Polymer	Δ WRA
IMO 900	19
Avalure AC 120	21
Luviquat FC 905	15

30

- IMO 900 : Isomaltose Oligosaccharide ex. Showa Sangyo Co.
- Avalure AC 120 :Polyacrylate ex. BF Goodrich

- Luviquat FC 905 :copolymer Vinylimidazolium methochloride & Vinylpyrrolidone
ex. BASF

Preferred components which have a deviation of fabric WRA versus water of at
least 15 are selected from a) shape retention polymers, b) polymers comprising
at least one unit which provide a dye transfer inhibiting benefit, c) polyurethanes,
d) Isomaltooligosaccharide, e) polyamine polymers, f) amphoteric polymers, g)
aminosilicones, h) curable silicones and mixtures thereof. Most preferred are the
polymers which are water-soluble. Furthermore, as used herein, the word
"component" is meant to include compounds having a WRA deviation versus
water of at least 15, mixtures of such components as well as mixtures of
components which per se do not have a WRA deviation versus water of at least
15 but which, in combination do have a WRA deviation versus water of at least
15. One such component is disclosed and claimed in co-pending application EP
99870222.9-2413.

a)-Shape Retention Polymer

Suitable shape retention polymers can be natural, or synthetic, and can act by
forming a film, and/or by providing adhesive properties. E.g., the present
invention can optionally use film-forming and/or adhesive polymer to impart
shape retention to fabric, particularly clothing. By "adhesive" it is meant that when
applied as a solution or a dispersion to a fiber surface and dried, the polymer can
attach to the surface. The polymer can form a film on the surface, or when
residing between two fibers and in contact with the two fibers, it can bind the two
fibers together. Other polymers such as Isomaltose Oligosaccharide can form a
film and/or bond the fibers together when the treated fabric is pressed by a hot
iron. Such a film will have adhesive strength, cohesive breaking strength, and
cohesive breaking strain.

Nonlimiting examples for natural polymers are Isomaltose Oligosaccharide and
their derivatives, and chitins and their derivatives.

The synthetic polymers useful in the present invention are comprised of
monomers. Some nonlimiting examples of monomers which can be used to form
the synthetic polymers of the present invention include: low molecular weight C1-

C₆ unsaturated organic mono-carboxylic and polycarboxylic acids, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid, and mixtures thereof; esters of said acids with C₁-C₁₂ alcohols, such as methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-methyl-1-propanol, 1-pentanol, 2-pentanol, 3-pentanol, 2-methyl-1-butanol, 1-methyl-1-butanol, 3-methyl-1-butanol, 1-methyl-1-pentanol, 2-methyl-1-pentanol, 3-methyl-1-pentanol, t-butanol, cyclohexanol, 2-ethyl-1-butanol, neodecanol, 3-heptanol, benzyl alcohol, 2-octanol, 6-methyl-1-heptanol, 2-ethyl-1-hexanol, 3,5-dimethyl-1-hexanol, 3,5,5-trimethyl-1-hexanol, 1-decanol, 1-dodecanol, and the like, and mixtures thereof. Nonlimiting examples of said esters are methyl acrylate, ethyl acrylate, t-butyl acrylate, methyl methacrylate, hydroxyethyl methacrylate, methoxy ethyl methacrylate, and mixtures thereof; amides and imides of said acids, such as N,N-dimethylacrylamide, N-t-butyl acrylamide, maleimides; low molecular weight unsaturated alcohols such as vinyl alcohol (produced by the hydrolysis of vinyl acetate after polymerization), allyl alcohol; esters of said alcohols with low molecular weight carboxylic acids, such as, vinyl acetate, vinyl propionate; ethers of said alcohols such as methyl vinyl ether; aromatic vinyl such as styrene, alpha-methylstyrene, t-butylstyrene, vinyl toluene, polystyrene macromer, and the like; polar vinyl heterocyclics, such as vinyl pyrrolidone, vinyl caprolactam, vinyl pyridine, vinyl imidazole, and mixtures thereof; other unsaturated amines and amides, such as vinyl amine, diethylene triamine, dimethylaminoethyl methacrylate, ethenyl formamide; vinyl sulfonate; salts of acids and amines listed above; low molecular weight unsaturated hydrocarbons and derivatives such as ethylene, propylene, butadiene, cyclohexadiene, vinyl chloride; vinylidene chloride; and mixtures thereof and alkyl quaternized derivatives thereof, and mixtures thereof. Preferably, said monomers are selected from the group consisting of vinyl alcohol; acrylic acid; methacrylic acid; methyl acrylate; ethyl acrylate; methyl methacrylate; t-butyl acrylate; t-butyl methacrylate; n-butyl acrylate; n-butyl methacrylate; isobutyl methacrylate; 2-ethylhexyl methacrylate; dimethylaminoethyl methacrylate; N,N-dimethyl acrylamide; N,N-dimethyl methacrylamide; N-t-butyl acrylamide; vinylpyrrolidone; vinyl pyridine; adipic acid; diethylenetriamine; salts thereof and alkyl quaternized derivatives thereof, and mixtures thereof.

Preferably, said monomers form homopolymers and/or copolymers (i.e., the film-forming and/or adhesive polymer) having a glass transition temperature (T_g) of from about -20°C to about 150°C, preferably from about -10°C to about 150°C,

- more preferably from about 0°C to about 100°C, most preferably, the adhesive polymer hereof, when dried to form a film will have a T_g of at least about 25°C., so that they are not unduly sticky, or "tacky" to the touch. Preferably said polymer is soluble and/or dispersible in water and/or alcohol. Said polymer typically has a molecular weight of at least about 500, preferably from about 1,000 to about 2,000,000, more preferably from about 5,000 to about 1,000,000, and even more preferably from about 30,000 to about 300,000 for some polymers.
- Some non-limiting examples of homopolymers and copolymers which can be used as film-forming and/or adhesive polymers of the present invention are: adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; adipic acid/epoxypropyl diethylenetriamine copolymer; poly(vinylpyrrolidone/dimethylaminoethyl methacrylate); polyvinyl alcohol; polyvinylpyridine n-oxide; methacryloyl ethyl betaine/methacrylates copolymer; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; polyamine resins; and polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride). Preferably, said copolymer and/or homopolymers are selected from the group consisting of adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; poly(vinylpyrrolidone/dimethylaminoethyl methacrylate); polyvinyl alcohol; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; methacryloyl ethyl betaine/methacrylates copolymer; polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride).
- Preferred polymers useful in the present invention are selected from the group consisting of copolymers of hydrophilic monomers and hydrophobic monomers. The polymer can be linear random or block copolymers, and mixtures thereof. Such hydrophobic/hydrophilic copolymers typically have a hydrophobic monomer/hydrophilic monomer ratio of from about 95:5 to about 20:80, preferably from about 90:10 to about 40:60, more preferably from about 80:20 to about

50:50 by weight of the copolymer. The hydrophobic monomer can comprise a single hydrophobic monomer or a mixture of hydrophobic monomers, and the hydrophilic monomer can comprise a single hydrophilic monomer or a mixture of hydrophilic monomers. The term "hydrophobic" is used herein consistent with its standard meaning of lacking affinity for water, whereas "hydrophilic" is used herein consistent with its standard meaning of having affinity for water. As used herein in relation to monomer units and polymeric materials, including the copolymers, "hydrophobic" means substantially water insoluble; "hydrophilic" means substantially water-soluble. In this regard, "substantially water insoluble" shall refer to a material that is not soluble in distilled (or equivalent) water, at 25°C., at a concentration of about 0.2% by weight, and preferably not soluble at about 0.1% by weight (calculated on a water plus monomer or polymer weight basis). "Substantially water-soluble" shall refer to a material that is soluble in distilled (or equivalent) water, at 25°C., at a concentration of about 0.2% by weight, and are preferably soluble at about 1% by weight. The terms "soluble", "solubility" and the like, for purposes hereof, corresponds to the maximum concentration of monomer or polymer, as applicable, that can dissolve in water or other solvents to form a homogeneous solution, as is well understood to those skilled in the art.

Nonlimiting examples of useful hydrophobic monomers are acrylic acid C₁-C₁₈ alkyl esters, such as methyl acrylate, ethyl acrylate, t-butyl acrylate; methacrylic C₁-C₁₈ alkyl esters, such as methyl methacrylate, 2-ethyl hexyl methacrylate, methoxy ethyl methacrylate; vinyl alcohol esters of carboxylic acids, such as, vinyl acetate, vinyl propionate, vinyl neodecanoate; aromatic vinyls, such as styrene, t-butyl styrene, vinyl toluene; vinyl ethers, such as methyl vinyl ether; vinyl chloride; vinylidene chloride; ethylene, propylene and other unsaturated hydrocarbons; and the like; and mixtures thereof. Some preferred hydrophobic monomers are methyl acrylate, methyl methacrylate, t-butyl acrylate, t-butyl methacrylate, n-butyl acrylate, n-butyl methacrylate, and mixtures thereof.

Nonlimiting examples of useful hydrophilic monomers are unsaturated organic mono-carboxylic and polycarboxylic acids, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid; unsaturated alcohols, such as vinyl alcohol, allyl alcohol; polar vinyl heterocyclics, such as vinyl pyrrolidone, vinyl caprolactam, vinyl pyridine, vinyl imidazole; vinyl amine; vinyl

sulfonate; unsaturated amides, such as acrylamides, e.g., N,N-dimethylacrylamide, N-t-butyl acrylamide; hydroxyethyl methacrylate; dimethylaminoethyl methacrylate; salts of acids and amines listed above; and the like; and mixtures thereof. Some preferred hydrophilic monomers are acrylic acid, methacrylic acid, N,N-dimethyl acrylamide, N,N-dimethyl methacrylamide, N-t-butyl acrylamide, dimethylamino ethyl methacrylate, vinyl pyrrolidone, salts thereof and alkyl quaternized derivatives thereof, and mixtures thereof.

Preferably, the shape retention copolymers contain hydrophobic monomers and hydrophilic monomers which comprise unsaturated organic mono-carboxylic and polycarboxylic acid monomers, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid, and salts thereof, and mixtures thereof; and optionally other hydrophilic monomers. These preferred polymers of the current invention surprisingly provide control of certain amine type malodors in fabrics, in addition to providing the fabric wrinkle control benefit. Examples of the hydrophilic unsaturated organic mono-carboxylic and polycarboxylic acid monomers are acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid, and mixtures thereof. Nonlimiting examples of the hydrophobic monomers are esters of the unsaturated organic mono-carboxylic and polycarboxylic acids cited hereinabove with C₁-C₁₂ alcohols, such as methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-methyl-1-propanol, 1-pentanol, 2-pentanol, 3-pentanol, 2-methyl-1-butanol, 1-methyl-1-butanol, 3-methyl-1-butanol, 1-methyl-1-pentanol, 2-methyl-1-pentanol, 3-methyl-1-pentanol, t-butanol, cyclohexanol, 2-ethyl-1-butanol, and mixtures thereof, preferably methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-methyl-1-propanol, t-butanol, and mixtures thereof. Compositions containing these polymers also can additionally comprise perfume, antibacterial active, odor control agent, static control agent, and mixtures thereof.

It is not intended to exclude the use of higher or lower levels of the polymers, as long as an effective amount is used to provide adhesive and film-forming properties to the composition and the composition can be formulated and effectively applied for its intended purpose.

Highly preferred adhesive and/or film-forming polymers that are useful in the composition of the present invention actually contain silicone moieties in the

polymers themselves. These preferred polymers include graft and block copolymers of silicone with moieties containing hydrophilic and/or hydrophobic monomers described hereinbefore. The silicone-containing copolymers in the composition of the present invention provide shape retention, body, and/or good, soft fabric feel.

Both silicone-containing graft and block copolymers useful in the present invention have the following properties:

- (1) the silicone portion is covalently attached to the non-silicone portion;
- (2) the molecular weight of the silicone portion is from about 1,000 to about 50,000; and
- (3) the non-silicone portion must render the entire copolymer soluble or dispersible in the wrinkle control composition vehicle and permit the copolymer to deposit on/adhere to the treated fabrics.

Suitable silicone copolymers include the following:

Preferred silicone-containing polymers are the silicone graft copolymers comprising acrylate groups described, along with methods of making them, in U.S. Patent No. 5,658,557, Bolich et al., issued Aug. 19, 1997, U.S. Patent No. 4,693,935, Mazurek, issued Sept. 15, 1987, and U.S. Patent No. 4,728,571, Clemens et al., issued Mar. 1, 1988. Additional silicone-containing polymers are disclosed in U.S. Pat. Nos. 5,480,634, Hayama et al, issued Oct. 2, 1996, 5,166,276, Hayama et al., issued Nov. 24, 1992, 5,061,481, issued Oct. 29, 1991, Suzuki et al., 5,106,609, Bolich et al., issued Apr. 21, 1992, 5,100,658, Bolich et al., issued Mar. 31, 1992, 5,100,657, Ansher-Jackson, et al., issued Mar. 31, 1992, 5,104,646, Bolich et al., issued Apr. 14, 1992, all of which are incorporated herein by reference.

These polymers preferably include copolymers having a vinyl polymeric backbone having grafted onto it monovalent siloxane polymeric moieties, and components consisting of non-silicone hydrophilic and hydrophobic monomers.

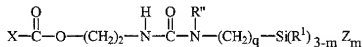
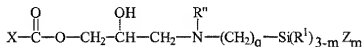
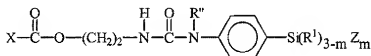
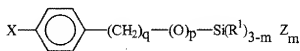
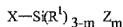
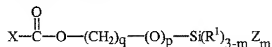
The silicone-containing monomers are exemplified by the general formula:



wherein X is a polymerizable group, such as a vinyl group, which is part of the backbone of the polymer; Y is a divalent linking group; R is a hydrogen, hydroxyl, lower alkyl (e.g. C₁-C₄), aryl, alkaryl, alkoxy, or alkylamino; Z is a monovalent polymeric siloxane moiety having an average molecular weight of at least about 500, is essentially unreactive under copolymerization conditions, and is pendant from the vinyl polymeric backbone described above; n is 0 or 1; and m is an integer from 1 to 3.

The preferred silicone-containing monomer has a weight average molecular weight of from about 1,000 to about 50,000, preferably from about 3,000 to about 40,000, most preferably from about 5,000 to about 20,000.

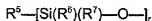
Nonlimiting examples of preferred silicone-containing monomers have the following formulas:



In these structures m is an integer from 1 to 3, preferably 1; p is 0 or 1; q is an integer from 2 to 6; n is an integer from 0 to 4, preferably 0 or 1, more preferably 0; R¹ is hydrogen, lower alkyl, alkoxy, hydroxyl, aryl, alkylamino, preferably R¹ is alkyl; Rⁿ is alkyl or hydrogen; X is



R³ is hydrogen or -COOH, preferably hydrogen; R⁴ is hydrogen, methyl or -CH₂COOH, preferably methyl; Z is



wherein R⁵, R⁶, and R⁷, independently are lower alkyl, alkoxy, alkylamino,
 10 hydrogen or hydroxyl, preferably alkyl; and r is an integer of from about 5 to about 700, preferably from about 60 to about 400, more preferably from about 100 to about 300. Most preferably, R⁵, R⁶, and R⁷ are methyl, p = 0, and q = 3.

Silicone-containing adhesive and/or film-forming copolymers useful in the present
 15 invention comprise from 0% to about 90%, preferably from about 10% to about 80%, more preferably from about 40% to about 75% of hydrophobic monomer, from about 0% to about 90%, preferably from about 5% to about 80% of hydrophilic monomer, and from about 5% to about 50%, preferably from about 10% to about 40%, more preferably from about 15% to about 25% of silicone-
 20 containing monomer.

The composition of any particular copolymer will help determine its formulation properties. In fact, by appropriate selection and combination of particular hydrophobic, hydrophilic and silicone-containing components, the copolymer can
 25 be optimized for inclusion in specific vehicles. For example, polymers which are soluble in an aqueous formulation preferably contain from 0% to about 70%, preferably from about 5% to about 70% of hydrophobic monomer, and from about 30% to about 98%, preferably from about 30% to about 80%, of hydrophilic monomer, and from about 1% to about 40% of silicone-containing monomer.
 30 Polymers which are dispersible preferably contain from 0% to about 70%, more preferably from about 5% to about 70%, of hydrophobic monomer, and from about 20% to about 80%, more preferably from about 20% to about 60%, of

hydrophilic monomer, and from about 1% to about 40% of silicone-containing monomer.

- 5 The silicone-containing copolymers preferably have a weight average molecular weight of from about 10,000 to about 1,000,000, preferably from about 30,000 to about 300,000.

- The preferred polymers comprise a vinyl polymeric backbone, preferably having a T_g or a T_m as defined above of about -20°C. and, grafted to the backbone, a polydimethylsiloxane macromer having a weight average molecular weight of from about 1,000 to about 50,000, preferably from about 5,000 to about 40,000, most preferably from about 7,000 to about 20,000. The polymer is such that when it is formulated into the finished composition, and then dried, the polymer phase separates into a discontinuous phase which includes the polydimethylsiloxane macromer and a continuous phase which includes the backbone. Exemplary silicone grafted polymers for use in the present invention include the following, where the composition of the copolymer is given with the approximate weight percentage of each monomer used in the polymerization reaction to prepare the copolymer: N,N-dimethylacrylamide/isobutyl methacrylate/(PDMS macromer - 20,000 approximate molecular weight) (20/60/20 w/w/w), copolymer of average molecular weight of about 400,000; N,N-dimethylacrylamide/(PDMS macromer -20,000 approximate molecular weight) (80/20 w/w), copolymer of average molecular weight of about 300,000; and t-butylacrylate/N,N-dimethylacrylamide/(PDMS macromer - 10,000 approximate molecular weight) (70/10/20), copolymer of average molecular weight of about 400,000.

- Highly preferred shape retention copolymers of this type contain hydrophobic monomers, silicone-containing monomers and hydrophilic monomers which comprise unsaturated organic mono- and polycarboxylic acid monomers, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid, and salts thereof, and mixtures thereof. These preferred polymers surprisingly provide control of certain amine type malodors in fabrics, in addition to providing the fabric wrinkle control benefit. A nonlimiting example of such

copolymer is n-butylmethacrylate /acrylic acid/(polydimethylsiloxane macromer, 20,000 approximate molecular weight) copolymer of average molecular weight of about 100,000, and with an approximate monomer weight ratio of about 70/10/20. A highly preferred copolymer is composed of acrylic acid, t-butyl acrylate and
5 silicone-containing monomeric units, preferably with from about 20% to about 90%, preferably from about 30% to about 80%, more preferably from about 50% to about 75% t-butyl acrylate; from about 5% to about 60%, preferably from about 8% to about 45%, more preferably from about 10% to about 30% of acrylic acid; and from about 5% to about 50%, preferably from about 10% to about 40%, more
10 preferably from about 15% to about 30% of polydimethylsiloxane of an average molecular weight of from about 1,000 to about 50,000, preferably from about 5,000 to about 40,000, most preferably from about 7,000 to about 20,000. Nonlimiting examples of acrylic acid/tert-butyl acrylate/polydimethyl siloxane macromer copolymers useful in the present invention, with approximate monomer
15 weight ratio, are: t-butylacrylate/acrylic acid/(polydimethylsiloxane macromer, 10,000 approximate molecular weight) (70/10/20 w/w/w), copolymer of average molecular weight of about 300,000; t-butyl acrylate/acrylic acid/(polydimethylsiloxane macromer, 10,000 approximate molecular weight) (63/20/17), copolymer of average molecular weight of from about 120,000 to
20 about 150,000; and n-butylmethacrylate/acrylic acid/ (polydimethylsiloxane macromer - 20,000 approximate molecular weight) (70/10/20 w/w/w), copolymer of average molecular weight of about 100,000. A useful and commercially available copolymer of this type is Diahold® ME from Mitsubishi Chemical Corp., which is a t-butyl acrylate/acrylic acid/ (polydimethylsiloxane macromer, 12,000
25 approximate molecular weight) (60/20/20), copolymer of average molecular weight of about 128,000.

Silicone Block Copolymers

Also useful herein are silicone block copolymers comprising repeating block units
30 of polysiloxanes.

Examples of silicone-containing block copolymers are found in U.S. Patent No. 5,523,365, to Geck et al., issued June 4, 1996; U.S. Patent No. 4,689,289, to Crivello, issued Aug. 25, 1987; U.S. Patent No. 4,584,356, to Crivello, issued
35 April 22, 1986; Macromolecular Design, Concept & Practice, Ed: M. K. Mishra, Polymer Frontiers International, Inc., Hopewell Jct., NY (1994), and Block

Copolymers, A. Noshay and J. E. McGrath, Academic Press, NY (1977), which are all incorporated by reference herein in their entirety. Other silicone block copolymers suitable for use herein are those described, along with methods of making them, in the above referenced and incorporated U.S. Patent No. 5,658,577.

The silicone-containing block copolymers useful in the present invention can be described by the formulas A-B, A-B-A, and $-(A-B)_n-$ wherein n is an integer of 2 or greater. A-B represents a diblock structure, A-B-A represents a triblock structure, and $-(A-B)_n-$ represents a multiblock structure. The block copolymers can comprise mixtures of diblocks, triblocks, and higher multiblock combinations as well as small amounts of homopolymers.

The silicone block portion, B, can be represented by the following polymeric structure

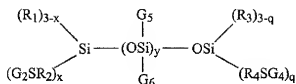


wherein each R is independently selected from the group consisting of hydrogen, hydroxyl, C₁-C₆ alkyl, C₁-C₆ alkoxy, C₂-C₆ alkylamino, styryl, phenyl, C₁-C₆ alkyl or alkoxy-substituted phenyl, preferably methyl; and m is an integer of about 10 or greater, preferably of about 40 or greater, more preferably of about 60 or greater, and most preferably of about 100 or greater.

The non-silicone block, A, comprises monomers selected from the monomers as described hereinabove in reference to the non-silicone hydrophilic and hydrophobic monomers for the silicone grafted copolymers. Vinyl blocks are preferred co-monomers. The block copolymers preferably contain one or more non-silicone blocks, and up to about 50%, preferably from about 10% to about 20%, by weight of one or more polydimethyl siloxane blocks.

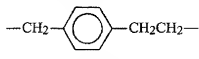
Also useful herein are sulfur-linked silicone containing copolymers, including block copolymers. As used herein in reference to silicone containing copolymers, the term "sulfur-linked" means that the copolymer contains a sulfur linkage (i.e., -S-), a disulfide linkage (i.e., -S-S-), or a sulphydryl group (i.e., -SH).

These sulfur-linked silicone-containing copolymers are represented by the following general formula:



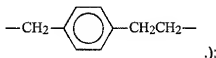
wherein

- each G₅ and G₆ is independently selected from the group consisting of alkyl, aryl, alkaryl, alkoxy, alkylamino, fluoroalkyl, hydrogen, and —ZSA, wherein
- 5 A represents a vinyl polymeric segment consisting essentially of polymerized free radically polymerizable monomer, and Z is a divalent linking group (Useful divalent linking groups Z include but are not limited to the following: C₁ to C₁₀ alkylene, alkarylene, aryene, and alkoxyalkylene. Preferably, Z is selected from the group consisting of methylene and propylene for reasons of commercial
- 10 availability.);
- each G₂ comprises A;
- each G₄ comprises A;
- each R₁ is a monovalent moiety selected from the group consisting of
- 15 alkyl, aryl, alkaryl, alkoxy, alkylamino, fluoroalkyl, hydrogen, and hydroxyl (Preferably, R₁ represents monovalent moieties which can independently be the same or different selected from the group consisting of C₁₋₄ alkyl and hydroxyl for reasons of commercial availability. Most preferably, R₁ is methyl.);
- each R₂ is a divalent linking group (Suitable divalent linking groups include but are not limited to the following: C₁ to C₁₀ alkylene, aryene,
- 20 alkarylene, and alkoxyalkylene. Preferably, R₂ is selected from the group consisting of C₁₋₃ alkylene and C₇₋₁₀ alkarylene due to ease of synthesis of the compound. Most preferably, R₂ is selected from the group consisting of —CH₂—, 1,3-propylene, and



- 25 each R₃ represents monovalent moieties which can independently be the same or different and are selected from the group consisting of alkyl, aryl, alkaryl, alkoxy, alkylamino, fluoroalkyl, hydrogen, and hydroxyl (Preferably, R₃ represents monovalent moieties which can independently be the same or different selected from the group consisting of C₁₋₄ alkyl and hydroxyl for
- 30 reasons of commercial availability. Most preferably, R₃ is methyl.);

each R_4 is a divalent linking group (Suitable divalent linking groups include but are not limited to the following: C_1 to C_{10} alkylene, arylene, alkarylene, and alkoxyalkylene. Preferably, R_4 is selected from the group consisting of C_1 -3 alkylene and C_7 - C_{10} alkarylene for ease of synthesis. Most preferably, R_4 is selected from the group consisting of $-CH_2-$, 1,3-propylene, and



x is an integer of 0-3;

y is an integer of 5 or greater (preferably y is an integer ranging from about 14 to about 700, preferably from about 20 to about 200); and

q is an integer of 0-3;

wherein at least one of the following is true:

q is an integer of at least 1;

x is an integer of at least 1;

G_5 comprises at least one $-ZSA$ moiety; or

G_6 comprises at least one $-ZSA$ moiety.

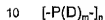
As noted above, A is a vinyl polymeric segment formed from polymerized free radically polymerizable monomers. The selection of A is typically based upon the intended uses of the composition, and the properties the copolymer must possess in order to accomplish its intended purpose. If A comprises a block in the case of block copolymers, a polymer having AB and/or ABA architecture will be obtained depending upon whether a mercapto functional group $-SH$ is attached to one or both terminal silicon atoms of the mercapto functional silicone compounds, respectively. The weight ratio of vinyl polymer block or segment, to silicone segment of the copolymer can vary. The preferred copolymers are those wherein the weight ratio of vinyl polymer segment to silicone segment ranges from about 98:2 to 50:50, in order that the copolymer possesses properties inherent to each of the different polymeric segments while retaining the overall polymer's solubility.

Sulfur linked silicone copolymers are described in more detail in U.S. Patent No. 5,468,477, to Kumar et al., issued November 21, 1995, and PCT Application No. WO 95/03776, assigned to 3M, published February 9, 1995, which are incorporated by reference herein in their entirety.

b)- Polymers comprising at least one unit which provide a dye transfer inhibiting benefit

- 5 The preferred polymers comprising at least one unit which provide a dye transfer inhibiting benefit are water-soluble polymers.

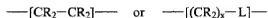
The polymers comprising at least one unit which provide a dye transfer inhibiting benefit useful in the present invention have the formula:



wherein the unit P is a polymer backbone which comprises units which are homopolymeric or copolymeric. D units are defined herein below. For the purposes of the present invention the term "homopolymeric" is defined as "a polymer backbone which is comprised of units having the same unit composition, i.e., formed from polymerization of the same monomer". For the purposes of the present invention the term "copolymeric" is defined as "a polymer backbone which is comprised of units having a different unit composition, i.e., formed from the polymerization of two or more monomers".

P backbones preferably comprise units having the formula:

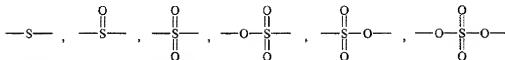
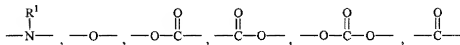
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wherein each R unit is independently hydrogen, $\text{C}_1\text{--C}_{12}$ alkyl, $\text{C}_6\text{--C}_{12}$ aryl, and D units as described herein below; preferably $\text{C}_1\text{--C}_4$ alkyl.

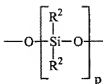
Each L unit is independently selected from heteroatom-containing moieties, non-limiting examples of which are selected from the group consisting of:

25

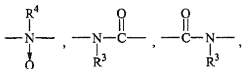


polysiloxane having the formula:

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wherein the index p is from 1 to about 6; units which have dye transfer inhibition activity:

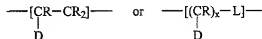


- 5 and mixtures thereof; wherein R¹ is hydrogen, C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof. R² is C₁-C₁₂ alkyl, C₁-C₁₂ alkoxy, C₆-C₁₂ aryloxy, and mixtures thereof; preferably methyl and methoxy. R³ is hydrogen C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof; preferably hydrogen or C₁-C₄ alkyl, more preferably
10 hydrogen. R⁴ is C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof.

The backbones of the polymers of the present invention comprise one or more D units which are units which comprise one or more units which provide a dye transfer inhibiting benefit. The D unit can be part of the backbone itself as represented in the general formula:



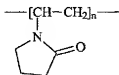
or the D unit may be incorporated into the backbone as a pendant group to a backbone unit having, for example, the formula:



- 20 However, the number of D units depends upon the formulation. For example, the number of D units will be adjusted to provide water solubility of the polymer as well as efficacy of dye transfer inhibition. The molecular weight of the polymers of the present invention are from about 500, preferably from about 1,000, more
25 preferably from about 10,000 most preferably from 200,000 to about 6,000,000, preferably to about 2,000,000, more preferably to about 1,000,000, yet more preferably to about 500,000, most preferably to about 360,000 daltons. Therefore the value of the index n is selected to provide the indicated molecular weight, and providing for a water solubility of at least 100 ppm, preferably at least about 300

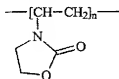
ppm, and more preferably at least about 1,000 ppm in water at ambient temperature which is defined herein as 25°C.

- Non-limiting examples of preferred D units are D units which comprise an amide moiety. Examples of polymers wherein an amide unit is introduced into the polymer via a pendant group includes polyvinylpyrrolidone having the formula:

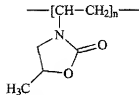


polyvinylloxazolidone having the formula:

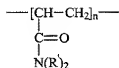
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polyvinylmethyloxazolidone having the formula:

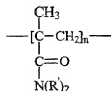


- 15 polyacrylamides and N-substituted polyacrylamides having the formula:

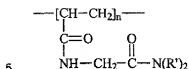


wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; polymethacrylamides and N-substituted polymethacrylamides having the general formula:

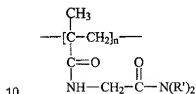
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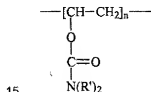
wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; poly(N-acrylylglycinamide) having the formula:



wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; poly(N-methacrylylglycinamide) having the formula:

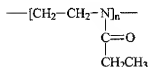


wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; polyvinylurethanes having the formula:



wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms.

An example of a D unit wherein the nitrogen of the dye transfer inhibiting moiety is incorporated into the polymer backbone is a poly(2-ethyl-2-oxazoline) having the formula:



wherein the index n indicates the number of monomer residues present.

The amino-functional polymers of the present invention can comprise any mixture of dye transfer inhibition units which provides the product with suitable properties. The preferred polymers which comprise D units which are amide moieties are those which have the nitrogen atoms of the amide unit highly substituted so the nitrogen atoms are in effect shielded to a varying degree by the surrounding non-polar groups. This provides the polymers with an amphiphilic character. Non-limiting examples include polyvinyl-pyrrolidones, polyvinylloxazolidones, N,N-disubstituted polyacrylamides, and N,N-disubstituted polymethacrylamides. A detailed description of physico-chemical properties of some of these polymers are given in "Water-Soluble Synthetic Polymers: Properties and Behavior", Philip Molyneux, Vol. I, CRC Press, (1983) included herein by reference.

The amide containing polymers may be present partially hydrolyzed and/or crosslinked forms. A preferred polymeric compound for the present invention is polyvinylpyrrolidone (PVP). This polymer has an amphiphilic character with a highly polar amide group conferring hydrophilic and polar-attracting properties, and also has non-polar methylene and methine groups, in the backbone and/or the ring, conferring hydrophobic properties. PVP is readily soluble in aqueous and organic solvent systems. PVP is available ex ISP, Wayne, New Jersey, and BASF Corp., Parsippany, New Jersey, as a powder or aqueous solutions in several viscosity grades, designated as, e.g., K-12, K-15, K-25, and K-30. These K-values indicate the viscosity average molecular weight, as shown below:

PVP viscosity average molecular weight (in thousands of daltons)	K-12	K-15	K-25	K-30	K-60	K-90
	2.5	10	24	40	160	360

PVP K-12, K-15, and K-30 are also available ex Polysciences, Inc. Warrington, Pennsylvania, PVP K-15, K-25, and K-30 and poly(2-ethyl-2-oxazoline) are available ex Aldrich Chemical Co., Inc., Milwaukee, Wisconsin. PVP K30 (40,000) through to K90 (360,000) are also commercially available ex BASF under the tradename Luviskol or commercially available ex ISP. Still higher molecular PVP like PVP 1.3MM, commercially available ex Aldrich is also suitable for use herein. Yet further PVP-type of material suitable for use in the present invention are polyvinylpyrrolidone-co-dimethylaminoethylmethacrylate, commercially available

- ex ISP in a quaternised form under the tradename Gafquat® or commercially available ex Aldrich Chemical Co. having a molecular weight of approximately 1.0MM; copolymer of 3-methyl-1-vinyl-1H-imidazolium chloride and 1-vinyl-2-pyrrolidone (30:70) ex BASF under the tradename Luviquat FC370, polyvinylpyrrolidone-co-vinyl acetate, available ex BASF under the tradename Luviskol®, available in vinylpyrrolidone:vinylacetate ratios of from 3:7 to 7:3; polyvinylpyrrolidone-co-vinylimidazoliumquat, commercially available ex BASF under the tradename Luviquat®.
- 10 Another D unit which provides dye transfer inhibition enhancement to the polymers described herein, are N-oxide units having the formula:



- wherein R¹, R², and R³ can be any hydrocarbyl unit (for the purposes of the present invention the term "hydrocarbyl" does not include hydrogen atom alone). The N-oxide unit may be part of a polymer, such as a polyamine, i.e., polyalkyleneamine backbone, or the N-oxide may be part of a pendant group attached to the polymer backbone. An example of a polymer which comprises the N-oxide unit as a part of the polymer backbone is polyethyleneimine N-oxide.
- 20 Non-limiting examples of groups which can comprise an N-oxide moiety include the N-oxides of certain heterocycles inter alia pyridine, pyrrole, imidazole, pyrazole, pyrazine, pyrimidine, pyridazine, piperidine, pyrrolidine, pyrrolidone, azolidine, morpholine. A preferred polymer is poly(4-vinylpyriding N-oxide, PVNO). In addition, the N-oxide unit may be pendant to the ring, for example,
- 25 aniline oxide.

- N-oxide comprising polymers of the present invention will preferably have a ratio of N-oxidized amine nitrogen to non-oxidized amine nitrogen of from about 1:0 to about 1:2, preferably to about 1:1, more preferably to about 3:1. The amount of N-oxide units can be adjusted by the formulator. For example, the formulator may co-polymerize N-oxide comprising monomers with non N-oxide comprising monomers to arrive at the desired ratio of N-oxide to non N-oxide amino units, or the formulator may control the oxidation level of the polymer during preparation. The amine oxide unit of the polyamine N-oxides of the present invention have a
- 30

Pk_a less than or equal to 10, preferably less than or equal to 7, more preferably less than or equal to 6. The average molecular weight of the N-oxide comprising polymers which provide a dye transfer inhibitor benefit to polymers is from about 500 daltons, preferably from about 10,000 daltons, more preferably from about 500,000 daltons to about 6,000,000 daltons, preferably to about 2,000,000 daltons, more preferably to about 360,000 daltons.

A further example of polymers which have dye transfer inhibition benefits are polymers which comprise both amide units and N-oxide units as described herein above. Non-limiting examples include co-polymers of two monomers wherein the first monomer comprises an amide unit and the second monomer comprises an N-oxide unit. In addition, oligomers or block polymers comprising these units can be taken together to form the mixed amide/N-oxide polymers. However, the resulting polymers must retain the water solubility requirements described herein above.

c)- Urethanes polymers

Polymers of the urethane type are also suitable components for use herein. A typical disclosure of polyurethane polymer can be found in EP844274A1 as well as in EP839903.

25 d)- Isomalttooligosaccharide

Isomalttooligosaccharides (IMO) (including mixtures), the individual components of said mixtures, substituted versions thereof, derivatised versions thereof, and mixtures thereof are suitable components for use herein. Currently IMO is used as corn syrup. These components are particularly suitable where cellulosic fibers/fabrics are used, such as cotton, rayon, ramie, jute, flax, linen, polynosic-fibers, Lyocell (Tencel[®]), polyester/cotton blends, other cotton blends, and the like, especially cotton, rayon, linen, polyester/cotton blends, and mixtures thereof.

Suitable fabric improving actives that are useful in the present invention include oligosaccharides with a degree of polymerization (DP) of from about 1 to about

- 15, preferably from about 2 to about 10, and wherein each monomer is selected from the group consisting of reducing saccharide containing 5 and/or 6 carbon atoms, including isomaltose, isomaltotriose, isomaltotetraose, isomaltooligosaccharide, fructooligosaccharide, levooligosaccharides, galactooligosaccharide, xylooligosaccharide, gentiooligosaccharides, disaccharides, glucose, fructose, galactose, xylose, mannose, arabinose, rhamnose, maltose, sucrose, lactose, maltulose, ribose, lyxose, allose, altrose, gulose, idose, talose, trehalose, nigerose, kojibiose, lactulose, oligosaccharides, maltooligosaccharides, trisaccharides, tetrasaccharides, pentasaccharides, hexasaccharides, oligosaccharides from partial hydrolysates of natural polysaccharide sources, and the like, and mixtures thereof, preferably mixtures of isomaltooligosaccharides, especially mixtures including isomaltooligosaccharides, comprising from about 3 to about 7 units of glucose, respectively, and which are linked by 1,2- α , 1,3- α , 1,4- α - and 1,6- α -linkages, and mixtures of these linkages.
- 15 Oligosaccharides containing β -linkages are also preferred. Preferred oligosaccharides are acyclic and have at least one linkage that is not an α -1,4-glycosidic bond. A preferred oligosaccharide is a mixture containing IMO: from 0 to about 20 % by weight of glucose, from about 10 to about 65 % of isomaltose, from about 1% to about 45% of each of isomaltotriose, isomaltotetraose and isomaltopentaose, from 0 to about 3 % of each of isomaltohexaose, isomaltoheptaose, isomaltooctaose and isomaltotonaose, from about 0.2% to about 15% of each of isomaltohexaose and isomaltoheptaose, and from 0 to about 50 % by weight of said mixture being isomaltooligosaccharides of 2 to 7 glucose units and from 0 to about 10 % by weight of said mixture being isomaltooligosaccharides of about 7 to about 10 glucose units. Other nonlimiting examples of preferred acyclic oligosaccharides, with approximate content by weight percent, are:

Isomaltooligosaccharide Mixture I

	Trisaccharides (maltotriose, panose, isomaltotriose)	40-65%
30	Disaccharides (maltose, isomaltose)	5-15%
	Monosaccharide (glucose)	0-20%
	Higher branched sugars ($4 < DP < 10$)	10-30%

Isomaltooligosaccharide Mixture II

	Trisaccharides (maltotriose, panose, isomaltotriose)	10-25%
35	Disaccharides (maltose, isomaltose)	10-55%
	Monosaccharide (glucose)	10-20%

	Higher branched sugars ($4 < DP < 10$)	5-10%
	Isomaltooligosaccharide Mixture III	
	Tetrasaccharides (stachyose)	10-40%
	Trisaccharides (raffinose)	0-10%
5	Disaccharides (sucrose, trehalose)	10-50%
	Monosaccharide (glucose, fructose)	0-10%
	Other higher branched sugars ($4 < DP < 10$)	0 - 5%

Oligosaccharide mixtures are either prepared by enzymatic reactions or separated as natural products from plant materials. The enzymatic synthesis of oligosaccharides involves either adding monosaccharides, one at a time, to a di- or higher saccharide to produce branched oligosaccharides, or it can involve the degradation of polysaccharides followed by transfer of saccharides to branching positions. For instance, Oligosaccharide Mixtures I and II are prepared by enzymatic hydrolysis of starch to maltooligosaccharides, which are then converted to isomaltooligosaccharides by a transglucosidase reaction. Oligosaccharide Mixture III, for example, is a mixture of oligosaccharides isolated from soybean. Soybean oligosaccharides such as Mixture III, are of pure natural origin.

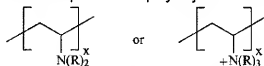
Substituted and/or derivatised materials of the oligosaccharides listed hereinabove are also suitable in the present invention. Nonlimiting examples of these materials include: carboxyl and hydroxymethyl substitutions (e.g., glucuronic acid instead of glucose); amino oligosaccharides (amine substitution, e.g., glucosamine instead of glucose); cationic quaternized oligosaccharides; C_6 -alkylated oligosaccharides; acetylated oligosaccharide ethers; oligosaccharides having amino acid residues attached (small fragments of glycoprotein); oligosaccharides containing silicone moieties. These substituted and/or derivatised oligosaccharides can provide additional benefits, such as: carboxyl and hydroxymethyl substitutions can introduce readily oxidizable materials on and in the fiber, thus reducing the probability of the fiber itself being oxidized by oxidants, such as bleaches; amine substitution can bind and/or condense with oxidatively damaged regions of the fiber to rejuvenate aged fabrics; acetylated sugar ethers can serve as bleach activators in subsequent processes where hydrogen peroxide is present; oligosaccharides having amino acid residues can improve delivery of fabric care benefits for fabrics containing proteinaceous fibers, e.g., wool and silk; and silicone-derivatised

oligosaccharides can provide additional fabric softness and lubricity. C₆ alkyl oligosaccharide is disclosed (along with other higher, viz., C₈-C₃₀, alkyl polysaccharides) in U.S. Pat. 4,565,647. Typical disclosure of C₁-C₆ alkylated oligosaccharides can also be found in U.S. 4,488,981. These patents are incorporated herein by reference.

One preferred isomaltooligosaccharide is IMO 900 commercially available from Showa Sangyo Co.

10 e)- Polyvinylamines polymers

Polyvinylamines polymers are also suitable component giving a deviation of fabric WRA of at least 15. Typical polyvinylamines polymers include the quaternized and non-quaternized polyvinylamines having the formula:



wherein R is hydrogen, C1-C12 linear or branched alkyl, benzyl, or alkyleneoxy having the formula (R1O)_zY, wherein R1 is C1-C6 linear or branched alkylene, Y is hydrogen or an anionic unit, non-limiting examples of which include, - (CH₂)_fCO₂M, -C(O)(CH₂)_fCO₂M, - (CH₂)_fPO₃M, - (CH₂)_fOPO₃M, - (CH₂)_fSO₃M, -CH₂(CHSO₃M)-(CH₂)_fSO₃M, -CH₂(CHSO₂M)(CH₂)_fSO₃M, -C(O)CH₂CH(SO₃M)CO₂M, -C(O)CH₂CH(CO₂M)NHCH(CO₂M)CH₂CO₂M, -C(O)CH₂CH(CO₂M)NHCH₂CO₂M, -CH₂CH(OZ)CH₂O(R1O)_zZ, - (CH₂)_fCH[O(R2O)_tZ]CH₂O(R2O)_tZ, and mixtures thereof, wherein Z is hydrogen or an anionic unit non-limiting examples of which include - (CH₂)_fCO₂M, -C(O)(CH₂)_fCO₂M, - (CH₂)_fPO₃M, - (CH₂)_fOPO₃M, - (CH₂)_fSO₃M, -CH₂(CHSO₃M)-(CH₂)_fSO₃M, -CH₂(CHSO₂M)(CH₂)_fSO₃M, -C(O)CH₂CH(SO₃M)CO₂M, -C(O)CH₂CH(CO₂M)NHCH(CO₂M)CH₂CO₂M, and mixtures thereof, M is a cation which provides charge neutrality; and the index f is from 0 to 6, t is 0 or 1, z is from 1 to 50.

30 The index x has the value from about 50 to about 1,500; preferably the index x has a value such that the resulting polymeric suds stabilizer has an average molecular weight of from about 2,500, preferably from about 10,000, more preferably from about 20,000 to about 150,000, preferably to about 90,000, more preferably to about 80,000 daltons.

- Most preferred polymers for use in the present invention are water-soluble, including IMO 900 (Isomaltose Oligosaccharide ex. Showa Sangyo Co.), Avalure AC 120 (Polyacrylate ex. BF Goodrich), Luviskol K30, K60 and K85 (Polyvinylpyrrolidone MW 40.000, 400.000 and 1.250.000 ex. BASF), Luvitec VPC 55K65W (copolymer Vinylpyrrolidone & Vinylcaprolactam ex. BASF), Luvitec Quat 73W (copolymer 1-methyl-3-vinylimidazolium-methylsulfate & 1-vinyl-2-pyrrolidone ex. BASF), Luviquat FC 905 (copolymer Vinylimidazolium methochloride & Vinylpyrrolidone ex. BASF), Sedipur 520 (modified Polyacrylamide ex. BASF), Chitanide 222 (Chitosan succinamide ex. MIP), Mirasil ADM-E (Aminodimethicone ex. Rhone-Poulenc), Percol 370 (diallyl amine polymer ex. CIBA), Amphomer HC (Acrylate / Octylacrylamide copolymer ex. National Starch), and mixtures thereof.
- More preferably, the water-soluble lubricant and the component, preferably polymer, having a deviation of fabric WRA of at least +15 are present in weight ratios of water-soluble lubricant to component of from 10:1 to 1:1. Indeed, it has been found that within these ratio ranges the resulting composition provides best in wear wrinkle benefit.

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f)- Amphoteric polymers

- Suitable for use herein are amphoteric polymers, i.e., polymers comprising at least one anionic moiety and one cationic moiety, and optionally a non-ionic moiety. The anionic moiety comprises a group which is a deprotonated anion of an acid group when the polymer is dissolved/dispersed in water at a pH of about 7 and which can be protonated to form a nonionic acid group when the polymer is dissolved/dispersed in water at an acidic pH. Representative examples of such groups include carboxylate, phosphonate, phosphate, phosphite, sulfonate, sulfate groups, and combinations thereof.

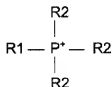
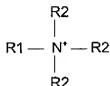
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Optionally, each moiety may be further complexed with a separate, cationic counterion other than hydrogen. When used, representative examples of such counterions, include Na⁺, Li⁺, K⁺, NH₄⁺ or combinations thereof.

The cationic moiety comprises a protonated cation when the polymer is dissolved/dispersed in water at a pH of about 7 or below and can be deprotonated to a nonionic form when the polymer is dissolved/dispersed in water at a basic pH. Alternatively, the cationic moiety comprises a group which is a quaternized group.

Representative examples of the protonated group include the ammonium functionality, phosphonium functionality, sulfonium functionality, and combinations thereof. The term ammonium refers to a moiety including a nitrogen atom linked to a plurality of moieties (either H, alkyl or aryl groups) by four bonds when dissolved/dispersed in water at a pH of 7. The term sulfonium refers to a moiety including a sulfur atom linked to three other moieties (either H, alkyl or aryl groups) when dispersed in water at a pH of about 7. The term phosphonium refers to a moiety including a phosphorous atom linked to four other moieties (either H, alkyl or aryl groups) when dispersed in water at a pH of about 7.

Examples of the ammonium, phosphonium and sulphonium functionality may be presented by the following formulae, respectively:



In these formulae, R1 represents the polymer backbone and R2 represents hydrogen, alkyl or aryl substituents. In case the cationic moiety exists as a quaternized group, all R2 groups represents alkyl or aryl substituents, excluding hydrogen.

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As an option, each such second functional group may be further complexed with a separate, anionic counterion. When used, representative examples of such counterion, include chlorides, sulfates, carbonates, nitrates, formates, perchlorates, or combinations thereof.

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Optionally, amphoteric polymers herein comprise a non-ionic moiety. A preferred class of amphoteric polymers for use herein are polymers composed of both cationic and anionic vinylmonomers.

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Suitable anionic vinylmonomers for use herein include salts of acrylic acid, methacrylic acid, crotonic acid, maleic acid, fumaric acid, itaconic acid and vinylsulphonic acid. Suitable cationic vinylmonomers for use herein include salts of unsaturated amines such as the hydrochloride salt of vinylamine, salts of N,N'-dialkylaminoalkyl (meth) acrylates and N,N'-dialkylaminoalkyl (meth) acrylamides such as the hydrochloride salt of dimethylaminoethylmethacrylate (DMAEMA.HCl) or dimethylaminopropylacrylamide; alkyl quaternized aminoalkyl (meth) acrylates and aminoalkyl (meth) acrylamides such as trimethylammoniummethyl methacrylatechloride, trimethylammoniumpropyl acrylamidemethylsulfate, alkyl quaternized polar vinyl heterocyclics such as based on pyridinium or imidazolium such as alkylvinylpyridinium, alkylvinylimidazolium and mixtures thereof.

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Optionally, a non-ionic comonomer can be incorporated, such as amides and imides of organic acids, such as acrylamide, N,N-dialkylacrylamide, N-t-butylacrylamide, maleimides, vinylformamide, aromatic vinyl monomers such as styrene, vinyltoluene, t-butylstyrene; polar vinyl heterocyclics such as vinyl pyrrolidone, vinyl caprolactam, vinyl pyridine, vinylimidazole; low molecular

30

weight unsaturated hydrocarbons and derivatives such as ethylene, propylene, butadiene, cyclohexadiene, vinylchloride and mixtures thereof.

5 A preferred polymer of this class is based on poly(vinylamine-co-acrylic acid), in molar ratios varying between 1:100 to 100:1, preferably 90:10 to 40:60. Polymers of this class preferably have a molecular weight between 20.000 and 5.000.000 preferably between 30.000 and 1.000.000, more preferably between 50.000 and 300.000.

10 A second class of polymers which are preferred for use herein are anionically modified polyethyleneimines. Examples of anionically modified polyethyleneimines include polyethyleneimines grafted with acrylic acid, methacrylic acid, maleic acid, fumaric acid, crotonic acid, itaconic acid, or carboxymethylated.

15 The processes for the preparation of anionically modified polyethyleneimines are well known. They can be prepared by reacting α,β -unsaturated carboxylic acids ($C=C-COOH$) like acrylic or maleic acid with polyethyleneimine (Michael-type reaction) or by carboxymethylation. The carboxymethylation is carried out by
20 reacting polyethyleneimine either with chloroacetic acid or with formaldehyde and sodium cyanide and subsequent saponification of the resultant aminonitrile. The latter procedure is well-known as the "Strecker Synthesis".

25 Polymers of this class have a degree of substitution of between 5 and 95, preferably 20 and 80, and a molecular weight between 5000 and 2 000 000, preferably 20 000 and 1 000 000.

30 In the present invention, the amphoteric polymers can be provided to the clothes in amounts of from 1×10^{-7} g / g fabric to 0.3 g / g fabric, preferably from 1×10^{-5} g / g fabric to 0.1 g / g fabric; more preferably from 1×10^{-3} g / g fabric to 1×10^{-2} g / g fabric.

g)- Aminosilicones

Suitable for use herein are aminosilicones, preferably those comprising an amine comprising a sterically hindered functional group.

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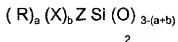
In the present invention, any known aminosilicone can be used to treat clothes so as to provide the desired benefit. Aminosilicones used in a domestic context have been described in numerous publications, for instance US 5,062,971 and US 5,064,543 as ironing aid; in WO 00/24853, WO/9201773 and
10 EP 300 525 in fabric conditioners, EP 150 867 and EP 150 872 in detergents and there is no need to redescribe such aminosilicones herein.

However, a particular problem that arises with most aminosilicones is that they eventually yellow fabrics. The phenomenon for such yellowing is not well
15 understood, but it does create a practical limitation to the use of aminosilicones to treat clothes: amino silicones can be used to treat clothes, but only in limited amounts such that the yellowing phenomenon does not become too visible, thereby limiting the performance of the composition.

20 It has now been found that there exists a particular class of amino silicones which is suitable for use in a domestic context and which does not yellow fabrics. Such silicones have been discussed in, e.g. US 5,688,889 as well as US 5540952, but only for use in an industrial context, and for a different benefit. In particular, in example 3 of those documents, a process is described in
25 which fabrics are immersed in a solution of the amino silicone in white spirit, and the fabrics are subsequently dried at 40°C for 15 minutes in a ventilated oven and then heated at 160°C for 30 min. This pad-dry-cure process is a standard process in textile industry, but it cannot be performed in a domestic context. This particular class of amino silicones is referred throughout this description as
30 aminosilicones comprising a sterically hindered functional group. Such aminosilicones have been described in US 5,540,952, EP 659 930, WO 00/5315,

US 5,688,889, WO 96/16110, WO 96/16124, WO 96/16127, WO 96/18667 and US 5,792,825, the contents of which are incorporated herein.

- The present invention utilizes amino silicones comprising a sterically hindered functional group, i.e. polyorganosiloxanes having, per mole, at least one unit of general formula:



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in which :

The symbols R are identical or different and represent a monovalent hydrocarbon radical chosen from linear or branched alkyl radicals having from 1 to 4 carbon atoms, the phenyl radical, the benzyl radical and the 3,3,3-trifluoropropyl radical;

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The symbols X are identical or different and represent a monovalent radical chosen from a hydroxyl group and a linear or branched alkoxy radical having from 1 to 3 carbon atoms;

- 20 The symbol Z represents a monovalent group of the formula R^1-U-S in which: R^1 is a divalent hydrocarbon radical chosen from :

- linear or branched alkylene radicals having from 2 to 18 carbon atoms;
- alkylenecarbonyl radicals in which the linear or branched alkylene part contains 2 to 20 carbon atoms;
- 25 • alkylenecyclohexylene radicals in which the linear or branched alkylene part contains from 2 to 12 carbon atoms and the cyclohexylene part contains an -OH group and optionally 1 or 2 alkyl radicals having from 1 to 4 carbon atoms;
- radicals of the formula R^2-O-R^3 in which the radicals R^2 and R^3 , which are identical or different, represent alkylene radicals having 1 to 12 carbon atoms;

- radicals of the formula R^2-O-R^3 - in which the radicals R^2 and R^3 have the meanings indicated above and one of them or both are substituted by one or two -OH group(s);
- radicals of the formula $R^2-COO-R^3$ - and $R^2-OCO-R^3$ - in which the radicals R^2 and R^3 have the meanings above;
- radicals of the formula $R^4-O-R^5-O-CO-R^6$ - in which the radicals R^4 , R^5 and R^6 , which are identical or different, represent alkylene radicals having 2 to 12 carbon atoms and the radical R^5 is optionally substituted by a hydroxyl group;
- radicals of the formula



in which the radical R^7 represents alkylene radicals having 1 to 4 carbon atoms, and the radical R^8 represents linear or branched alkylene radicals having 1 to 4 carbon atoms, the phenyl radical and the phenylalkyl radical where the linear or branched alkyl part contains 1 to 3 carbon atoms; and where x is a number chosen between 0, 1 and 2.

U represents -O- or -NR⁹-, R^9 being a radical chosen from a hydrogen atom, a linear or branched alkyl radical having from 1 to 6 carbon atoms, a divalent radical -R¹- having the meaning indicated above, one of the valency bonds being connected to the nitrogen of -NR⁹- and the other being connected to a silicon atom and a divalent radical of the formula -R¹⁰-N(R¹)-S

in which R^1 has the meaning indicated above, and R^{10} represents a linear or branched alkylene radical having from 1 to 12 carbon atoms, one of the valency bonds (that of R^{10}) being connected to the nitrogen atom of -NR⁹- and the other (that of R^1) being connected to a silicon atom.

S represents a monovalent group, in which :

- the free valency is a carbon atom, carrying a secondary or tertiary amine function, comprised in a cyclic hydrocarbon chain or in a heterocyclic chain comprising from 6 to 30 carbon atoms, in which the two atoms of the cyclic chain in the positions α and α' relative to the nitrogen atom, do not comprise any hydrogen atom;
- the free valency is a carbon atom, carrying a secondary or tertiary amine function, comprised in a linear hydrocarbon chain comprising 6 to 40 carbon atoms, in which the two atoms of the cyclic chain in the positions α and α' relative to the nitrogen atom, do not comprise any hydrogen atom.

Preferably, the secondary or tertiary amine function in S is incorporated in a piperidyl group.

a is a number chosen from 0, 1 and 2;

b is a number chosen from 0, 1 and 2;

the sum $a + b$ is not greater than 2.

The polyorganosiloxane used can additionally comprise (an) other siloxyl unit(s).

Such amino silicones comprising a sterically hindered functional group which are suitable for use herein are commercially available from Rhodia under the trade name Rhodorsil ®, in particular Rhodorsil ® H 21645 or Rhodorsil ® H 21650 or Silicex ®, in particular Silicex ® 263.

In the present invention, thanks to their ability not to yellow fabrics, the aminosilicones comprising a sterically hindered amino functional group can be provided to the clothes in amounts from 1×10^{-7} g / g fabric to 0.3 g / g fabric, preferably from 1×10^{-6} g / g fabric to 0.1 g / g fabric; more preferably from 1×10^{-3} g / g fabric to 1×10^{-2} g / g fabric, i.e. in amounts which are greater than the amounts in which other amino silicones can be used. Thus, a greater benefit can be obtained without observing fabric yellowing.

h)- Curable silicones

Also suitable for use herein are curable silicones. "Curable" silicone molecules have the ability to reach one with each other to yield a polymeric elastomer of a much higher molecular weight compared to the original molecule. Thus, "curing" often occurs when two curable silicone molecules or curable silicone polymers react yielding a polymer of a higher molecular weight. This "cure" reaction is define herein as the formation of new silicon-oxygen, silicon-carbon, and/or carbon-carbon linkages. Curable silicones can be cross-linked to some degree before application. That means that the curable silicone has cured to some degree before application but that can still further cure during and after application. Cross-linked curable silicones are preferred.

Examples of curable silicones are vinyl-, allyl-, silane-, epoxy-, alkoxy-, and/or silanol-modified polydimethylsiloxanes, and mixtures thereof. Some curable silicones may required the cooperative use of a catalyst to induce curing, as in the case of vinyl,hydrogen-modified silicones which cure via a hydrosilation process catalyzed by platinum compounds or radical catalysts. More preferred in this invention are curable silicone able to cure without the addition of a catalysts, such as epoxy-, alkoxy-, and/or silanol-modified polydimethylsiloxanes. Most preferred are silanol-stopped polydimethyl-siloxanes emulsions.

Curable silicones can have other organic group modifications as for example, although not restricting, amino or polyalkyleneoxide groups. Curable silicones may content reinforcing fillers. By reinforcing fillers we mean small particles made of inorganic or organic materials added to the curable silicone as additives or intimately linked to silicone molecules via covalent bonds. One example, although not restricting, are silica particles sized from 10 to 100 nanometers present in 10% to 100% by weight based on the weight of the silicone.

It is preferred that curable silicones are formulated as oil-in-water emulsions. Curable silicone emulsions are commercially available; e.g., GE-Bayer SM2112 Silicone Emulsions or Dow Corning Syl-Off® 7922 Catalyst Emulsion.

- 5 It is believed that curable silicones cure during or/and after application to the fabrics producing a network which will prevent the formation of wrinkles.

- Other suitable film-forming polymers for use herein are durable press polymers. Durable press polymers are optional components of the invention.
- 10 These polymers can be a cross-linking resin having the property of being cationic. By "cross-linking resin having the property of being cationic", it is meant that the resin is at least partially positively charged. It is not however necessary that the reactive part of the molecule carries the positive charge. Indeed, polymeric resins can be based on positively charged monomers which help the
- 15 deposition on the fibers.

- Cross-linking resins having the property of being cationic suitable for use herein are those commonly known as having wet strength in the paper field. At least two mechanisms have been postulated to account for the mechanism by which wet
- 20 strength resin act. One is that wet strength resins form covalent bonds between adjacent fibers while another is that the wet strength resin places a layer over the hydrogen bonds formed between adjacent paper fibers and thus prevents water from breaking the hydrogen bonds.

- 25 Conventional wet-strength agents suitable for use herein include compounds made of epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, amine-aldehyde resins such as melamine-formaldehyde resin, amide-aldehyde resins, and mixtures thereof. For use within the meaning of the present invention,
- 30 there can also be used materials of the above-mentioned classes of substances which admittedly do not themselves possess any outstanding wet-strength

properties but, nevertheless, have the same durable press effect as do the wet-strength agents as described therein.

- Among the class of epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, the preferred components are the polymeric amine-epichlorohydrin resins selected from the group consisting of a polyamide-epichlorohydrin (PAE) resin, a polyalkylenepolyamine-epichlorohydrin (PAPAE) resin, and an amine polymer-epichlorohydrin (APE) resin, in which the amine groups have been alkylated with epichlorohydrin to produce a polyamine-epichlorohydrin resin that has azetidinium or epoxide functionality. Preferably, for use herein, the cross-linking resin having cationic properties is a cationic wet strength resin that is produced by reacting a saturated aliphatic dicarboxylic acid containing three to ten carbon atoms with a polyalkylenepolyamine, containing from two to four ethylene groups, two primary amine groups, and one to three secondary amine groups (such as diethylenetriamine, triethylenetetramine and tetraethylenepentamine), to form a poly(aminoamide) having secondary amine groups that are alkylated with epichlorohydrin to form a PAE resin.
- These polyamide/polyamine/epichlorohydrin wet-strength resins are fully described by Carr, Doane, Hamerstrand and Hofreiter, in an article appearing in the Journal of Applied Polymer Science Vol. 17, pp. 721-735 (1973). Such resins are available as KYMENE from Hercules, Inc. A commercial synthesis of such resins from adipic acid, diethylene triamine and epichlorohydrin is described in the Carr et al publication, *ibid.*, and is U.S. Pat. No. 2,926,154 (Feb. 23, 1960) to G. I. Keim or US 4,240,995. Reference can be made to these publications for further details regarding the preparation of polyamide/polyamine/epichlorohydrin resins.
- Most preferred cross-linking resin having cationic properties from this class are the wet strength resin Kymene 557H (available from Hercules Incorporated), in which adipic acid is reacted with diethylenetriamine to form a poly(aminoamide)

that is alkylated and crosslinked with epichlorohydrin to form a PAE resin. Still another preferred cross-linking resin having cationic properties made of epichlorohydrin are Luresin.RTM and Etadurin which both are polyamidoamine-epichlorohydrin resins.

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Amine-aldehyde resins are suitable cross-linking resins for the present invention and are made by condensation of amine or amide monomers with aldehydes such as formaldehyde or glyoxal. Preferred amines are those having low molecular weight amines e.g. melamine or polymeric amines e.g. polydiallylamine, preferably quaternized. Preferred amides are those polymeric amides such as polyacrylamide. All these suitable amine/amide monomers can also be copolymerized with cationic monomers.

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Among the class of amine-aldehyde cross-linking resin, preferred are those from the class of melamine-formaldehyde resin. Melamine-formaldehyde resins of this type are known as crosslinking agents of this type in the coating industry and are also described, for example, in German Auslegeschrift Nos. 2,457,387 (U.S. Pat. No. 4,035,213 incorporated herein by reference) and 1,719,324 and, in particular, in U.S. Pat. No. 3,242,230 incorporated herein by reference.

20

Preferred melamine-formaldehyde resin are those commercially available under the tradenames Madurit, and Cassurit from Clariant.

Still other preferred cross-linking resin having the property of being cationic among the class of amine-aldehyde cross-linking resin are the Poly(acrylamide-glyoxal) resin commercially available under the tradename SOLIDURIT KM from Clariant.

25

According to the present invention, there can also be used a mixture of wet-strength agents of the above-mentioned types or equivalent compounds.

30

Preferably for the purpose of the invention, the cross-linking resin having cationic properties have a molecular weight between 200 and 1,000,000, preferably

between 500 and 100,000, most preferably between 1000 and 25,000. Cross-linking resin having a low molecular weight are most preferred for use in the present invention as they are more water-soluble and have a better fiber penetration. By low molecular weight it is meant a molecular weight within the range of from 25 to 2000, preferably from 50 to 1000, and more preferably from 50 to 500.

It is desirable if the level of cross-linking components or derivative thereof is present in an amount of from 0.01% to 60%, preferably from 0.01% to 30% by weight of the total composition

It is advantageous for aldehyde containing cross-linking resins if a catalyst is used with compositions of the invention. Preferred catalysts includes organic acids such as citric acid, succinic acid, and tartaric acids, as well as conventional Lewis acid such as $AlCl_3$ or $MgCl_2$, or salts thereof, or mixtures thereof. A typical example of catalyst is the catalyst NKD made of a mixture of salts and organic acid, and commercially available from Hoechst.

It is preferred if the level of catalyst is from 10% to 50%, preferably from 20 to 40% by weight of the cross-linking components or derivative thereof.

For other cross-linking resins like the Kymene, the use of a catalyst is not necessary.

3)- Optionals :

The composition of the invention may also comprise one or more of the following optional ingredients.

a) Durable press polymer

Durable press polymers are optional components of the invention. These polymers can be a cross-linking resin having the property of being cationic. By

"cross-linking resin having the property of being cationic", it is meant that the resin is at least partially positively charged. It is not however necessary that the reactive part of the molecule carries the positive charge. Indeed, polymeric resins can be based on positively charged monomers which help the deposition on the fibers.

Cross-linking resins having the property of being cationic suitable for use herein are those commonly known as having wet strength in the paper field. At least two mechanisms have been postulated to account for the mechanism by which wet strength resin act. One is that wet strength resins form covalent bonds between adjacent fibers while another is that the wet strength resin places a layer over the hydrogen bonds formed between adjacent paper fibers and thus prevents water from breaking the hydrogen bonds.

Conventional wet-strength agents suitable for use herein include compounds made of epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, amine-aldehyde resins such as melamine-formaldehyde resin, amide-aldehyde resins, and mixtures thereof. For use within the meaning of the present invention, there can also be used materials of the above-mentioned classes of substances which admittedly do not themselves possess any outstanding wet-strength properties but, nevertheless, have the same durable press effect as do the wet-strength agents as described therein.

Among the class of epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, the preferred components are the polymeric amine-epichlorohydrin resins selected from the group consisting of a polyamide-epichlorohydrin (PAE) resin, a polyalkylenepolyamine-epichlorohydrin (PAPAE) resin, and an amine polymer-epichlorohydrin (APE) resin, in which the amine groups have been alkylated with epichlorohydrin to produce a polyamine-epichlorohydrin resin that has azetidinium or epoxide functionality. Preferably, for use herein, the cross-linking resin having cationic properties is a cationic wet strength resin that is produced by reacting a saturated aliphatic dicarboxylic acid containing three to ten carbon atoms with a polyalkylenepolyamine, containing from two to four ethylene groups, two primary amine groups, and one to three

secondary amine groups (such as diethylenetriamine, triethylenetetramine and tetraethylenepentamine), to form a poly(aminoamide) having secondary amine groups that are alkylated with epichlorohydrin to form a PAE resin.

- 5 These polyamide/polyamine/epichlorohydrin wet-strength resins are fully described by Carr, Doane, Hamerstrand and Hofreiter, in an article appearing in the Journal of Applied Polymer Science Vol. 17, pp. 721-735 (1973). Such resins are available as KYMENE from Hercules, Inc. A commercial synthesis of such resins from adipic acid, diethylene triamine and epichlorohydrin is described in
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- 15 Most preferred cross-linking resin having cationic properties from this class are the wet strength resin Kymene 557H (available from Hercules Incorporated), in which adipic acid is reacted with diethylenetriamine to form a poly(aminoamide) that is alkylated and crosslinked with epichlorohydrin to form a PAE resin. Still another preferred cross-linking resin having cationic properties made of
20 epichlorohydrin are Luresin.RTM and Etadurin which both are polyamidoamine-epichlorohydrin resins.

- Amine-aldehyde resins are suitable cross-linking resins for the present invention and are made by condensation of amine or amide monomers with aldehydes
25 such as formaldehyde or glyoxal. Preferred amines are those having low molecular weight amines e.g. melamine or polymeric amines e.g. polydiallylamine, preferably quaternized. Preferred amides are those polymeric amides such as polyacrylamide. All these suitable amine/amide monomers can also be copolymerized with cationic monomers.

- 30 Among the class of amine-aldehyde cross-linking resin, preferred are those from the class of melamine-formaldehyde resin. Melamine-formaldehyde resins of this type are known as crosslinking agents of this type in the coating industry and are also described, for example, in German Auslegeschrift Nos. 2,457,387 (U.S. Pat.
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- 5 Still other preferred cross-linking resin having the property of being cationic among the class of amine-aldehyde cross-linking resin are the Poly(acrylamide-glyoxal) resin commercially available under the tradename SOLIDURIT KM from Clariant.
- 10 According to the present invention, there can also be used a mixture of wet-strength agents of the above-mentioned types or equivalent compounds.

- Preferably for the purpose of the invention, the cross-linking resin having cationic properties have a molecular weight between 200 and 1,000,000, preferably
- 15 between 500 and 100,000, most preferably between 1000 and 25,000. Cross-linking resin having a low molecular weight are most preferred for use in the present invention as they are more water-soluble and have a better fiber penetration. By low molecular weight it is meant a molecular weight within the range of from 25 to 2000, preferably from 50 to 1000, and more preferably from
- 20 50 to 500.

- It is desirable if the level of cross-linking components or derivative thereof is present in an amount of from 0.01% to 60%, preferably from 0.01% to 30% by weight of the total composition

- 25 It is advantageous for aldehyde containing cross-linking resins if a catalyst is used with compositions of the invention. Preferred catalysts includes organic acids such as citric acid, succinic acid, and tartaric acids, as well as conventional Lewis acid such as $AlCl_3$ or $MgCl_2$, or salts thereof, or mixtures thereof. A typical
- 30 example of catalyst is the catalyst NKD made of a mixture of salts and organic acid, and commercially available from Hoechst.

- It is preferred if the level of catalyst is from 10% to 50%, preferably from 20 to 40% by weight of the cross-linking components or derivative thereof.

For other cross-linking resins like the Kymene, the use of a catalyst is not necessary.

b) Liquid carrier

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Another optional, but preferred, ingredient is a liquid carrier. The liquid carrier employed in the instant compositions is preferably at least primarily water due to its low cost, relative availability, safety, and environmental compatibility. The level of water in the liquid carrier is preferably at least about 50%, most preferably at least about 60%, by weight of the carrier. Mixtures of water and low molecular weight, e.g., <about 200, organic solvent, e.g., lower alcohols such as ethanol, propanol, isopropanol or butanol are useful as the carrier liquid. Low molecular weight alcohols include monohydric, dihydric (glycol, etc.) trihydric (glycerol, etc.), and higher polyhydric (polyols) alcohols.

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c) Dispersibility Aids

Relatively concentrated compositions containing both saturated and unsaturated diester quaternary ammonium compounds can be prepared that are stable without the addition of concentration aids. However, the compositions of the present invention may require organic and/or inorganic concentration aids to go to even higher concentrations and/or to meet higher stability standards depending on the other ingredients. These concentration aids which typically can be viscosity modifiers may be needed, or preferred, for ensuring stability under extreme conditions when particular softener active levels are used. The surfactant concentration aids are typically selected from the group consisting of (1) single long chain alkyl cationic surfactants; (2) nonionic surfactants; (3) amine oxides; (4) fatty acids; and (5) mixtures thereof. These aids are described in WO 94/20597, specifically on page 14, line 12 to page 20, line 12, which is herein incorporated by reference.

When said dispersibility aids are present, the total level is from 0.1% to 20%, preferably from 0.2% to 10%, more preferably from 0.5% to 5%, and even more preferably from 1% to 2% by weight of the composition. These materials can either be added as part of the active softener raw material, (I), e.g., the mono-long chain alkyl cationic surfactant and/or the fatty acid which are reactants used to form the biodegradable fabric softener active as discussed hereinbefore, or

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added as a separate component. The total level of dispersibility aid includes any amount that may be present as part of component (I).

5 Inorganic viscosity/dispersibility control agents which can also act like or augment the effect of the surfactant concentration aids, include water-soluble, ionizable salts which can also optionally be incorporated into the compositions of the present invention. A wide variety of ionizable salts can be used. Examples of suitable salts are the halides of the Group IA and IIA metals of the Periodic Table of the Elements, e.g., calcium chloride, magnesium chloride, sodium chloride, 10 potassium bromide, and lithium chloride. The ionizable salts are particularly useful during the process of mixing the ingredients to make the compositions herein, and later to obtain the desired viscosity. The amount of ionizable salts used depends on the amount of active ingredients used in the compositions and can be adjusted according to the desires of the formulator. Typical levels of salts 15 used to control the composition viscosity are from about 20 to about 20,000 parts per million (ppm), preferably from about 20 to about 11,000 ppm, by weight of the composition.

Alkylene polyammonium salts can be incorporated into the composition to give viscosity control in addition to or in place of the water-soluble, ionizable salts 20 above. In addition, these agents can act as scavengers, forming ion pairs with anionic detergent carried over from the main wash, in the rinse, and on the fabrics, and may improve softness performance. These agents may stabilize the viscosity over a broader range of temperature, especially at low temperatures, compared to the inorganic electrolytes.

25 Specific examples of alkylene polyammonium salts include L-lysine monohydrochloride and 1,5-diammonium 2-methyl pentane dihydrochloride.

30 d) Stabilizers

Stabilizers can be present in the compositions of the present invention. The term "stabilizer," as used herein, includes antioxidants and reductive agents. These agents are present at a level of from 0% to about 2%, preferably from about 0.01% to about 0.2%, more preferably from about 0.035% to about 0.1% for 35 antioxidants, and more preferably from about 0.01% to about 0.2% for reductive agents. These assure good odor stability under long term storage conditions for

the compositions and compounds stored in molten form. The use of antioxidants and reductive agent stabilizers is especially critical for low scent products (low perfume).

- 5 Examples of antioxidants that can be added to the compositions of this invention include a mixture of ascorbic acid, ascorbic palmitate, propyl gallate, available from Eastman Chemical Products, Inc., under the trade names Tenox® PG and Tenox S-1; a mixture of BHT (butylated hydroxytoluene), BHA (butylated hydroxyanisole), propyl gallate, and citric acid, available from Eastman Chemical
- 10 Products, Inc., under the trade name Tenox-6; butylated hydroxytoluene, available from UOP Process Division under the trade name Sustane® BHT; tertiary butylhydroquinone, Eastman Chemical Products, Inc., as Tenox TBHQ; natural tocopherols, Eastman Chemical Products, Inc., as Tenox GT-1/GT-2; and butylated hydroxyanisole, Eastman Chemical Products, Inc., as BHA; long chain
- 15 esters (C₈-C₂₂) of gallic acid, e.g., dodecyl gallate; Irganox® 1010; Irganox® 1035; Irganox® B 1171; Irganox® 1425; Irganox® 3114; Irganox® 3125; and mixtures thereof; preferably Irganox® 3125, Irganox® 1425, Irganox® 3114, and mixtures thereof; more preferably Irganox® 3125 alone. The chemical names and CAS numbers for some of the above stabilizers are listed in Table II below.

20

TABLE II

Antioxidant	CAS No.	Chemical Name used in Code of Federal Regulations
Irganox® 1010	6683-19-8	Tetrakis (methylen(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)) methane
25 Irganox® 1035	41484-35-9	Thiodiethylene bis(3,5-di-tert-butyl-4-hydroxyhydrocinnamate
Irganox® 1098	23128-74-7	N,N'-Hexamethylene bis(3,5-di-tert-butyl-4-hydroxyhydrocinnamide
30 Irganox® B 1171	31570-04-4	
	23128-74-7	1:1 Blend of Irganox® 1098 and Irgafos® 168
Irganox® 1425	65140-91-2	Calcium bis(monoethyl(3,5-di-tert-butyl-4-hydroxybenzyl)phosphonate)
Irganox® 3114	65140-91-2	Calcium bis(monoethyl(3,5-di-tert-butyl-4-hydroxybenzyl)phosphonate)
35 Irganox® 3125	34137-09-2	3,5-Di-tert-butyl-4-hydroxy-hydrocinnamic acid

triester with 1,3,5-tris(2-hydroxyethyl)-S-triazine-2,4,6-(1H, 3H, 5H)-trione

Irgafos® 168 31570-04-4 Tris(2,4-di-tert-butyl-phenyl)phosphite

- 5 Examples of reductive agents include sodium borohydride, hypophosphorous acid, Irgafos® 168, and mixtures thereof.

e) Preservative

- 10 Optionally, but preferably, antimicrobial preservative can be added to the composition of the present invention. Contamination by certain microorganisms with subsequent microbial growth can result in an unsightly and/or malodorous solution. Because microbial growth in solutions is highly objectionable when it occurs, it is highly preferable to include an antimicrobial preservative, which is
15 effective for inhibiting and/or regulating microbial growth in order to increase storage stability of the composition.

- It is preferable to use a broad spectrum preservative, e.g., one that is effective on both bacteria (both gram positive and gram negative) and fungi. A limited
20 spectrum preservative, e.g., one that is only effective on a single group of microorganisms, e.g., fungi, can be used in combination with a broad spectrum preservative or other limited spectrum preservatives with complimentary and/or supplementary activity. A mixture of broad spectrum preservatives can also be used. In some cases where a specific group of microbial contaminants is
25 problematic (such as Gram negatives), aminocarboxylate chelators, such as those described hereinbefore, can be used alone or as potentiators in conjunction with other preservatives. These chelators which include, e.g., ethylenediaminetetraacetic acid (EDTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepentaacetic acid, and other aminocarboxylate chelators, and
30 mixtures thereof, and their salts, and mixtures thereof, can increase preservative effectiveness against Gram-negative bacteria, especially *Pseudomonas* species.

- Antimicrobial preservatives useful in the present invention include biocidal compounds, i.e., substances that kill microorganisms, or biostatic compounds,
35 i.e., substances that inhibit and/or regulate the growth of microorganisms. Well-known preservatives such as short chain alkyl esters of p-hydroxybenzoic acid,

commonly known as parabens; N-(4-chlorophenyl)-N'-(3,4-dichlorophenyl) urea, also known as 3,4,4'-trichlorocarbaniide or triclocarban; 2,4,4'-trichloro-2'-hydroxy diphenyl ether, commonly known as triclosan are useful preservative in the present invention.

5

Still other preferred preservatives are the water-soluble preservatives, i.e. those that have a solubility in water of at least about 0.3 g per 100 ml of water, i.e., greater than about 0.3% at room temperature, preferably greater than about 0.5% at room temperature.

10

The preservative in the present invention is included at an effective amount. The term "effective amount" as herein defined means a level sufficient to prevent spoilage, or prevent growth of inadvertently added microorganisms, for a specific period of time. In other words, the preservative is not being used to kill microorganisms on the surface onto which the composition is deposited in order to eliminate odors produced by microorganisms. Instead, it is preferably being used to prevent spoilage of the solution in order to increase the shelf-life of the composition. Preferred levels of preservative are from about 0.0001% to about 0.5%, more preferably from about 0.0002% to about 0.2%, most preferably from about 0.0003% to about 0.1%, by weight of the usage composition.

20

The preservative can be any organic preservative material which will not cause damage to fabric appearance, e.g., discoloration, coloration, bleaching. Preferred water-soluble preservatives include organic sulfur compounds, halogenated compounds, cyclic organic nitrogen compounds, low molecular weight aldehydes, quaternary ammonium compounds, dehydroacetic acid, phenyl and phenolic compounds, and mixtures thereof. Non-limiting examples of preferred water-soluble preservatives for use in the present invention can be found in U.S. Patent 5,714,137, incorporated hereinbefore by reference, as well as co-pending application PCT/US 98/12154 pages 29 to 36.

25

30

Preferred water-soluble preservatives for use in the present invention are organic sulfur compounds. Some non-limiting examples of organic sulfur compounds suitable for use in the present invention are:

35

3-Isothiazolone Compounds: A preferred preservative is an antimicrobial, organic preservative containing 3-isothiazolone groups. This class of compounds is disclosed in U.S. Pat. No. 4,265,899, Lewis et al., issued May 5, 1981, and incorporated herein by reference. A preferred preservative is a water-soluble mixture of 5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one, more preferably a mixture of about 77% 5-chloro-2-methyl-4-isothiazolin-3-one and about 23% 2-methyl-4-isothiazolin-3-one, a broad spectrum preservative available as a 1.5% aqueous solution under the trade name Kathon® CG by Rohm and Haas Company.

When Kathon® is used as the preservative in the present invention it is present at a level of from about 0.0001% to about 0.01%, preferably from about 0.0002% to about 0.005%, more preferably from about 0.0003% to about 0.003%, most preferably from about 0.0004% to about 0.002%, by weight of the composition.

Other isothiazolins include 1,2-benzisothiazolin-3-one, available under the trade name Proxel® products; and 2-methyl-4,5-trimethylene-4-isothiazolin-3-one, available under the trade name Promexal®. Both Proxel and Promexal are available from Zeneca. They have stability over a wide pH range (i.e., 4-12). Neither contain active halogen and are not formaldehyde releasing preservatives. Both Proxel and Promexal are effective against typical Gram negative and positive bacteria, fungi and yeasts when used at a level from about 0.001% to about 0.5%, preferably from about 0.005% to about 0.05%, and most preferably from about 0.01% to about 0.02% by weight of the usage composition.

Sodium Pyrithione : Another preferred organic sulfur preservative is sodium pyrithione, with water solubility of about 50%. When sodium pyrithione is used as the preservative in the present invention it is typically present at a level of from about 0.0001% to about 0.01%, preferably from about 0.0002% to about 0.005%, more preferably from about 0.0003% to about 0.003%, by weight of the usage composition.

Mixtures of the preferred organic sulfur compounds can also be used as the preservative in the present invention.

f) Antimicrobial active

The composition may suitably use an optional solubilized, water-soluble antimicrobial active, useful in providing protection against organisms that become attached to the treated material. The free, uncomplexed antimicrobial, e.g.,
5 antibacterial, active provides an optimum antibacterial performance.

Sanitization of fabrics can be achieved by the compositions of the present invention containing, antimicrobial materials, e.g., antibacterial halogenated compounds, quaternary compounds, and phenolic compounds.

10

Biguanides. Some of the more robust antimicrobial halogenated compounds which can function as disinfectants/sanitizers as well as finish product preservatives (vide infra), and are useful in the compositions of the present invention include 1,1'-hexamethylene bis(5-(p-chlorophenyl)biguanide),
15 commonly known as chlorhexidine, and its salts, e.g., with hydrochloric, acetic and gluconic acids. The digluconate salt is highly water-soluble, about 70% in water, and the diacetate salt has a solubility of about 1.8% in water. When chlorhexidine is used as a sanitizer in the present invention it is typically present at a level of from about 0.001% to about 0.4%, preferably from about 0.002% to
20 about 0.3%, and more preferably from about 0.01% to about 0.1%, by weight of the usage composition. In some cases, a level of from about 1% to about 2% may be needed for virucidal activity.

Other useful biguanide compounds include Cosmocil® CQ®, Vantocil® IB,
25 including poly (hexamethylene biguanide) hydrochloride. Other useful cationic antimicrobial agents include the bis-biguanide alkanes. Usable water-soluble salts of the above are chlorides, bromides, sulfates, alkyl sulfonates such as methyl sulfonate and ethyl sulfonate, phenylsulfonates such as p-methylphenyl sulfonates, nitrates, acetates, gluconates, and the like.

30

As stated hereinbefore, the bis biguanide of choice is chlorhexidine and its salts, e.g., digluconate, dihydrochloride, diacetate, and mixtures thereof.

Quaternary Compounds. A wide range of quaternary compounds can also be
35 used as antimicrobial actives, in conjunction with the preferred surfactants, for compositions of the present invention that do not contain cyclodextrin. Non-

limiting examples of useful quaternary compounds include: (1) benzalkonium chlorides and/or substituted benzalkonium chlorides such as commercially available Barquat® (available from Lonza), Maquat® (available from Mason), Variquat® (available from Witco/Sherex), and Hyamine® (available from Lonza);

5 (2) dialkyl quaternary such as Bardac® products of Lonza, (3) N-(3-chloroallyl) hexaminium chlorides such as Dowicide® and Dowicil® available from Dow; (4) benzethonium chloride such as Hyamine® 1622 from Rohm & Haas; (5) methylbenzethonium chloride represented by Hyamine® 10X supplied by Rohm & Haas, (6) cetylpyridinium chloride such as Cepacol chloride available from

10 Merrell Labs. Typical concentrations for biocidal effectiveness of these quaternary compounds range from about 0.001% to about 0.8%, preferably from about 0.005% to about 0.3%, more preferably from about 0.01% to 0.2%, by weight of the usage composition. The corresponding concentrations for the concentrated compositions are from about 0.003% to about 2%, preferably from

15 about 0.006% to about 1.2%, and more preferably from about 0.1% to about 0.8% by weight of the concentrated compositions.

Other preservatives which are conventional in the art, such as described in US 5,593, 670 incorporated herein by reference, may also be used herein.

20 g) Perfume

The present invention can contain a perfume. Suitable perfumes are disclosed in U.S. Pat. 5,500,138, said patent being incorporated herein by reference.

25 As used herein, perfume includes fragrant substance or mixture of substances including natural (i.e., obtained by extraction of flowers, herbs, leaves, roots, barks, wood, blossoms or plants), artificial (i.e., a mixture of different nature oils or oil constituents) and synthetic (i.e., synthetically produced) odoriferous

30 substances. Such materials are often accompanied by auxiliary materials, such as fixatives, extenders, stabilizers and solvents. These auxiliaries are also included within the meaning of "perfume", as used herein. Typically, perfumes are complex mixtures of a plurality of organic compounds.

35 Examples of perfume ingredients useful in the perfumes of the present invention compositions include, but are not limited to, hexyl cinnamic aldehyde; amyl

cinnamic aldehyde; amyl salicylate; hexyl salicylate; terpineol; 3,7-dimethyl-cis-2,6-octadien-1-ol; 2,6-dimethyl-2-octanol; 2,6-dimethyl-7-octen-2-ol; 3,7-dimethyl-3-octanol; 3,7-dimethyl-trans-2,6-octadien-1-ol; 3,7-dimethyl-6-octen-1-ol; 3,7-dimethyl-1-octanol; 2-methyl-3-(para-tert-butylphenyl)-propionaldehyde; 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde; 5 tricyclodecanyl propionate; tricyclodecanyl acetate; anisaldehyde; 2-methyl-2-(para-isopropylphenyl)-propionaldehyde; ethyl-3-methyl-3-phenyl glycidate; 4-(para-hydroxyphenyl)-butan-2-one; 1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-2-buten-1-one; para-methoxyacetophenone; para-methoxy-alpha-phenylpropene; methyl-2-n-hexyl-3-oxo-cyclopentane carboxylate; undecalac-tone gamma.

Additional examples of fragrance materials include, but are not limited to, orange oil; lemon oil; grapefruit oil; bergamot oil; clove oil; dodecalactone gamma; methyl-2-(2-pentyl-3-oxo-cyclopentyl) acetate; beta-naphthol methylether; methyl-15 beta-naphthylketone; coumarin; decylaldehyde; benzaldehyde; 4-tert-butylcyclohexyl acetate; alpha,alpha-dimethylphenethyl acetate; methylphenylcarbonyl acetate; Schiff's base of 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate; cyclic ethyleneglycol diester of tridecandioic acid; 3,7-dimethyl-2,6-octadiene-1-nitrile; ionone gamma methyl; ionone alpha; ionone beta; petitgrain; methyl cedrylone; 7-acetyl-20 1,2,3,4,5,6,7,8-octahydro-1,1,6,7-tetramethyl-naphthalene; ionone methyl; methyl-1,6,10-trimethyl-2,5,9-cyclododecatrien-1-yl ketone; 7-acetyl-1,1,3,4,4,6-hexamethyl tetralin; 4-acetyl-6-tert-butyl-1,1-dimethyl indane; benzophenone; 6-acetyl-1,1,2,3,3,5-hexamethyl indane; 5-acetyl-3-isopropyl-1,1,2,6-tetramethyl 25 indane; 1-dodecanal; 7-hydroxy-3,7-dimethyl octanal; 10-undecen-1-al; isohexenyl cyclohexyl carboxaldehyde; formyl tricyclodecan; cyclopentadecanolide; 16-hydroxy-9-hexadecenoic acid lactone; 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-gamma-2-benzopyrane; ambroxane; dodecahydro-3a,6,6,9a-tetramethylnaphtho-[2,1b]furan; cedrol; 5-(2,2,3-trimethylcyclopent-3-30 enyl)-3-methylpentan-2-ol; 2-ethyl-4-(2,2,3-trimethyl-3-cyclopenten-1-yl)-2-buten-1-ol; caryophyllene alcohol; cedryl acetate; para-tert-butylcyclohexyl acetate; patchouli; olibanum resinoid; labdanum; vetiver; copaiba balsam; fir balsam; and condensation products of: hydroxycitronellal and methyl anthranilate; hydroxycitronellal and indol; phenyl acetaldehyde and indol; 4-(4-hydroxy-4-methyl pentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate.

- More examples of perfume components are geraniol; geranyl acetate; linalool; linalyl acetate; tetrahydrolinalool; citronellol; citronellyl acetate; dihydromyrcenol; dihydromyrcenyl acetate; tetrahydromyrcenol; terpinyl acetate; nopol; nopyl acetate; 2-phenylethanol; 2-phenylethyl acetate; benzyl alcohol; benzyl acetate;
- 5 benzyl salicylate; benzyl benzoate; styrallyl acetate; dimethylbenzylcarbinol; trichloromethylphenylcarbinyl methylphenylcarbinyl acetate; isononyl acetate; vetiveryl acetate; vetiverol; 2-methyl-3-(p-tert-butylphenyl)-propanal; 2-methyl-3-(p-isopropylphenyl)-propanal; 3-(p-tert-butylphenyl)-propanal; 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde; 4-acetoxy-3-pentyltetrahydropyran;
- 10 methyl dihydrojasmonate; 2-n-heptylcyclopentanone; 3-methyl-2-pentyl-cyclopentanone; n-decanal; n-dodecanal; 9-decenol-1; phenoxyethyl isobutyrate; phenylacetaldehyde dimethylacetal; phenylacetaldehyde diethylacetal; geranonitrile; citronellonitrile; cedryl acetal; 3-isocamphylcyclohexanol; cedryl methylether; isolongifolanone; aubepine nitrile; aubepine; heliotropine; eugenol;
- 15 vanillin; diphenyl oxide; hydroxycitronellal ionones; methyl ionones; isomethyl ionones; irones; cis-3-hexenol and esters thereof; indane musk fragrances; tetralin musk fragrances; isochroman musk fragrances; macrocyclic ketones; macrolactone musk fragrances; ethylene brassylate.
- 20 The perfumes useful in the present invention compositions are substantially free of halogenated materials and nitromusks.

- Suitable solvents, diluents or carriers for perfumes ingredients mentioned above are for examples, ethanol, isopropanol, diethylene glycol, monoethyl ether,
- 25 dipropylene glycol, diethyl phthalate, triethyl citrate, etc. The amount of such solvents, diluents or carriers incorporated in the perfumes is preferably kept to the minimum needed to provide a homogeneous perfume solution.

- Perfume can be present at a level of from 0% to 10%, preferably from 0.1% to
- 30 5%, and more preferably from 0.2% to 3%, by weight of the finished composition. Fabric softener compositions of the present invention provide improved fabric perfume deposition.

- Perfume ingredients may also be suitably added as releasable fragrances, for
- 35 example, as pro-perfumes or pro-fragrances as described in U.S. 5,652,205 Hartman et al., issued July 29, 1997, WO95/04809, WO96/02625, PCT

US97/14610 filed 19 August 1997 and claiming priority of 19 August 1996, EP-A-0,752,465, co-pending application EP 98870227.0, EP 98870226.2, EP 99870026.4, and EP 99870025.6; all incorporated herein by reference.

5 h) Soil Release Agent

Soil Release agents are desirably used in compositions of the instant invention. Any polymeric soil release agent known to those skilled in the art can optionally be employed in the compositions of this invention. Polymeric soil release agents
10 are characterized by having both hydrophilic segments, to hydrophilize the surface of hydrophobic fibers, such as polyester and nylon, and hydrophobic segments, to deposit upon hydrophobic fibers and remain adhered thereto through completion of washing and rinsing cycles and, thus, serve as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to
15 treatment with the soil release agent to be more easily cleaned in later washing procedures.

If utilized, soil release agents will generally comprise from about 0.01% to about 10.0%, by weight, of the detergent compositions herein, typically from about 0.1%
20 to about 5%, preferably from about 0.2% to about 3.0%.

The following, all included herein by reference, describe soil release polymers suitable for use in the present invention. U.S. 3,959,230 Hays, issued May 25, 1976; U.S. 3,893,929 Basadur, issued July 8, 1975; U.S. 4,000,093, Nicol, et al.,
25 issued December 28, 1976; U.S. Patent 4,702,857 Gosselink, issued October 27, 1987; U.S. 4,968,451, Scheibel et al., issued November 6; U.S. 4,702,857, Gosselink, issued October 27, 1987; U.S. 4,711,730, Gosselink et al., issued December 8, 1987; U.S. 4,721,580, Gosselink, issued January 26, 1988; U.S. 4,877,896, Maldonado et al., issued October 31, 1989; U.S. 4,956,447, Gosselink
30 et al., issued September 11, 1990; U.S. 5,415,807 Gosselink et al., issued May 16, 1995; European Patent Application 0 219 048, published April 22, 1987 by Kud, et al..

Further suitable soil release agents are described in U.S. 4,201,824, Violland et al.; U.S. 4,240,918 Lagasse et al.; U.S. 4,525,524 Tung et al.; U.S. 4,579,681, Ruppert et al.; U.S. 4,240,918; U.S. 4,787,989; U.S. 4,525,524; EP 279,134 A,

1988, to Rhone-Poulenc Chemie; EP 457,205 A to BASF (1991); and DE 2,335,044 to Unilever N. V., 1974 all incorporated herein by reference.

Commercially available soil release agents include the METOLOSE SM100,
5 METOLOSE SM200 manufactured by Shin-etsu Kagaku Kogyo K.K., SOKALAN
type of material, e.g., SOKALAN HP-22, available from BASF (Germany),
ZELCON 5126 (from Dupont) and MILEASE T (from ICI).

i)- pH

10

An optional requirement of the compositions according to the present invention is
that the pH as measured in the neat compositions at 20°C, is greater than 3,
preferably between 3 and 12, more preferably between 4 and 8, most preferably
is of 5. This range is preferred for fabric safety. The pH of these compositions
15 herein can be regulated by the addition of a Bronsted acid.

j)- Blowing agents

Also suitable for use herein are blowing agents selected from the group
20 consisting of ammonium carbonate, ammonium bicarbonate, or mixtures thereof.
It is hypothesized that those agents, when present, will generate small amounts
of CO₂ when exposed to heat, such as during the ironing process. The CO₂ will
be released in the composition which is deposited as a film on the fabric. The
film, hence the fabric, will thus acquire more flexibility, resulting in a better ability
25 to resist to the dry formation of wrinkles, when the fabric is stored or worn.

k) Void fillers

30

The compositions herein may further comprise void fillers. By fabric void
filler, it is meant herein particles having the size and shape suited to fill the
structural defects in cotton, and hereby provide lubricating properties.
Cyclodextrins such as those described in WO 99/55950 can be used as void
35 fillers, as well as polyolefin dispersions, such as those described in US

6,020,302. Inorganic particles can also be used to that effect, for instance TiO_2 and Silica.

l) Other optional ingredients

5

The present invention can include optional components conventionally used in textile treatment compositions, for example, humectants like diethylene glycol, and/or salts like lithium salts, colorants, bactericides, optical brighteners, opacifiers, anti-shrinkage agents, germicides, fungicides, anti-oxidants, color protection agent like dye fixing agent as described in EP 931133, enzymes, chelating agents, cyclodextrin as described in WO 98/56888, metallic salts to absorb amine and sulfur-containing compounds and selected from the group consisting of copper salts, zinc salts, and mixtures thereof, water-soluble polyionic polymers, e.g., water-soluble cationic polymer like polyamines, and water-soluble anionic polymers like polyacrylic acids, other antistatic agent, insect and/or moth repelling agents, colorants and dyes, anti-clogging agent, and the like; typical disclosure of which can be found in WO 98/56888. Still other suitable optional ingredients are ingredients which provide shield protection against stain like hydroxypropylcellulose as well as other cellulosic polymer like carboxymethylcellulose. The compositions are preferably free of any material that would soil or stain fabric, and are also substantially free of starch. Typically, there should be less than about 0.5%, by weight of the composition, preferably less than about 0.3%, more preferably less than about 0.1%, by weight of the composition, of starch and/or modified starch.

25

4)- Form of the composition :

30

The composition of the invention may take a variety of physical form including liquid, liquid-gel, paste-like, foam in either aqueous or non-aqueous form, powder like granular and tablet forms. A preferred form of the composition is in a liquid form.

35

When in a liquid form, the composition is preferably dispensed by a dispensing means such as a spray dispenser, aerosol dispenser, or refill thereof. Still another preferred dispensing means is by incorporation of the composition of the invention in the ironing tank per se, or via a cartridge preferably adapted for the iron.

5)- Spray Dispenser :

The present invention also relates to such compositions incorporated into a spray dispenser to create an article of manufacture that can facilitate treatment of fabric articles and/or surfaces with the compositions according to the invention at a level that is effective. The spray dispenser comprises manually activated and non-manual powered (operated) spray means and a container containing the treating composition. Typical disclosure of such spray dispenser can be found in WO 96/04940 page 19 line 21 to page 22 line 27. Preferably, the spray dispenser is selected from spray dispenser comprising battery operated pump, spray dispenser comprising a trigger spray device, spray dispenser comprising a pressurized aerosol spray dispenser.

6)- Method of use :

It has been found that the use of the water-soluble lubricant provided a reduction of the WRA compared to water. Accordingly, there is provided a method of increasing the WRA of fabrics, which comprises the steps of contacting the fabrics with a water-soluble lubricant as defined herein before, using a domestic process.

It has also been found that the use of the water-soluble lubricant or composition of the invention provides surprisingly good benefit on the dewrinkling performance upon wearing. This benefit is particularly achieved while spraying the compound or composition preferably from an iron during an otherwise known fabric ironing process. Accordingly, there is also provided a method of treating fabrics, in particular to provide in wear wrinkle resistance on fabrics, which comprises the steps of contacting the fabrics with a water-soluble lubricant or composition according to the invention, as defined herein before, using a domestic process.

By "contacting", it is meant any steps that is suitable for providing a contact of the composition with the fabric. This can include by soaking, washing, rinsing, and/or spraying as well as by means of a dryer sheet onto which is adsorbed the composition. Preferably, the contacting occurs after the laundering and optional drying of the fabrics, e.g. by spraying the composition, more preferably by spraying the composition from an iron spray dispenser and/or via the vaporisation holes from an iron sole plate or foam or sprayer which is separate from the iron. Accordingly, in this instance, the composition of the present invention is used as an ironing aid. An effective amount of the composition can be sprayed onto the fabric, wherein said fabric should not be sprayed to saturation. Still another preferred way of treating the fabrics is when the fabric can be sprayed with an effective amount of the composition, allowed to dry and then ironed, or sprayed and ironed immediately.

Accordingly, in a further aspect of the invention, the composition of the invention can also be sprayed onto the fabrics by means of spraying means which are incorporated to an iron, and the composition is incorporated into the iron's water tank or via a cartridge, adapted to fit within the iron. Such irons are disclosed for instance in WO 00/08247 and WO 99/27176. As for the method of spraying via the iron, the spraying means should preferably be capable of providing droplets with a weight average diameter of from about 40 to about 200 μm , preferably from about 70 to about 150 μm . Preferably, the loading of moisture on fabrics made of natural and synthetic fibers is from about 5 to about 25%, more preferably from about 5 to about 10% by weight of the dried fabric.

By "wrinkle reducing composition", it is meant that the composition is tested on 100% cotton, woven Oxford pinpoint fabric according to the procedure given in W. Garner, Textile Laboratory Manual Vol. 6, Ed. 3, Elsevier Inc., 1967, p. 105, so called "cylinder test". The cylinder test consists in taking a 12X14 inch of treated cloth, rolling it round a plastic tube, placing the roll in a 360 ml measuring cylinder ($r = 0.67$ inch, $l = 15.7$ inch), withdrawing the tube, and pushing the fabric down to occupy a volume of about 90 ml by means of a plastic tube which is an easy sliding fit for the cylinder. This test is carried out on cloth conditioned for 24 hours at 21°C (70°F) and 65% RH. The cloth is left 1 minute in the cylinder, opened immediately, inspected visually, and then compared with a cloth only

treated with water. The results obtained are compared against fabrics which have only been treated with water. Wrinkle reducing compositions are compositions which provide a better crease resistance versus water, i.e, fabrics that have been treated with a composition of the invention show less wrinkles
5 compared to fabrics which have only been treated with water.

In a still further aspect of the invention, the composition can be sprayed onto fabrics by an in-home de-wrinkling chamber containing the fabric to be dewrinkled, thereby providing ease of operation. Conventional personal as well
10 as industrial de-wrinkling apparatuses are suitable for use herein. Traditionally, these apparatuses act by a steaming process which effects a relaxation of the fibers. Examples of home dewrinkling chambers include shower stalls. The spraying of the composition or compounds onto the fabrics can then occur within the chamber of the apparatus or before placing the fabrics into the chamber. As
15 for the manual method of spraying, the spraying means should preferably be capable of providing droplets with a weight average diameter of from about 8 to about 100 μm , preferably from about 10 to about 50 μm . Preferably, the loading of moisture on fabrics made of natural and synthetic fibers is from about 5 to about 25%, more preferably from about 5 to about 10% by weight of the dried
20 fabric. Other conventional steps that can be carried out in the dewrinkling apparatus can be applied such as heating which will provide the curing step and drying. Preferably, for optimum dewrinkling benefit, the temperature profile inside the chamber ranges from about 40°C to about 80°C, more preferably from about 50°C to about 70°C. The preferred length of the drying cycle is from about 15 to
25 about 60 minutes, more preferably from about 20 to about 45 minutes.

The steaming step in the dewrinkling apparatus can also be eliminated if the composition is maintained at a temperature range from about 22°C (about 72°F) to about 76°C (170°F) before spraying.
30

The present invention encompasses the method of spraying a mist of an effective amount of solution of the invention composition onto fabric and/or fabric articles. Preferably, said fabric and/or fabric articles include, but are not limited to, clothes, curtains, drapes, upholstered furniture, carpeting, bed linens, bath linens,
35 tablecloths, sleeping bags, tents, car interiors, etc.

The compositions herein are especially useful, when used to treat garments for extending the time before another wash cycle is needed, and/or even reducing the time involved in ironing. Such garments include uniforms and other garments which are normally treated in an industrial process, which can be dewrinkled and the time between treatments extended.

7)- Article of manufacture :

Also provided herein is an article of manufacture comprising a container and the composition of the invention in association with a set of instructions to use the composition in an amount effective to provide a solution to problems involving and/or provision of a benefit related to those selected from reducing wrinkles; imparting in-wear resistance to fabrics. It is important that the consumer be aware of these additional benefits, since otherwise the consumer would not know that the composition would solve these problems and/or provide these benefits.

As used herein, the phrase "in association with" means the set of instructions are either directly printed on the container itself or presented in a separate manner including, but not limited to, a brochure, print advertisement, electronic advertisement, and/or verbal communication, so as to communicate the set of instructions to a consumer of the article of manufacture. The set of instructions preferably comprises the instruction to apply an effective amount of the composition, preferably by spraying, to provide the indicated benefit, e.g. wrinkles reduction; imparting in-wear resistance to fabrics. The set of instructions preferably comprises instructions to spray the composition on the fabrics and iron the fabrics.

The invention is illustrated in the following non limiting examples, in which all percentages are on a weight basis unless otherwise stated.

In the examples, the abbreviated component identifications have the following meanings:

Polymer 1: Isomalto oligosaccharide available from Showa Sangyo Co. under the trade name IMO 900

Polymer 2: Polyvinylpyrrolidone available from BASF under the trade name Luviskol K30

Polymer 3: Co-polymer of vinylpyrrolidone and vinylcaprolactame available from BASF under the trade name Luvitec VPC

- 5 Polymer 4: Co-polymer of vinylpyrrolidone and vinylimidazolium methachloride available from BASF under the trade name Luviquat FC 905

Lubricant 1: Polyalkylene oxide polysiloxane commercially available under the tradename of Silwet 7200 from OSI Chem./Witco

- 10 Lubricant 2: Polyalkylene oxide polysiloxane commercially available under the tradename of Silwet 7657 from OSI Chem./Witco

Lubricant 3: Polyethoxylated (20 moles) sorbitan monolaurate commercially available under the tradename of Radiesurf 7137 from FINA

Lubricant 4: Polyethoxylated (20 moles) sorbitan tristearate commercially available under the tradename of Tween 65

- 15 Wetting agent 1: Polyalkylene oxide polysiloxane commercially available under the tradename of Silwet 7600 from OSI Chem./Witco

Wetting agent 1: Polyalkylene oxide polysiloxane commercially available under the tradename of Silwet L 77 from OSI Chem./Witco

- 20 Emulsifier 1: CAE 10 (coconut alcohol condensed with an average of 10 moles of ethylene oxide)

	A	B	C	D	E	F
Polymer #1	5%	-	-	-	-	1%
Polymer #2	-	1%	-	2%	-	-
Polymer #3	-	-	2 %	-	-	-
Polymer #4	-	-	-	-	0.5 %	-
Lubricant #1	14 %	4 %	-	-	1.5 %	-
Lubricant #2	-	-	6 %	2 %	1.5 %	-
Lubricant #3	8 %	2 %	-	-	-	5%
Lubricant #4	-	-	-	3 %	-	-
Wetting agent 1	3 %	0.5	-	-	0.2 %	-
Wetting agent 2	-	-	0.5 %	-	-	-
Dipropyleneglycol	-	0.3	-	-	-	-

	A	B	C	D	E	F
Emulsifier 1	0.6 %	0.2	-	-	-	-
Cyclodextrin	-	0.5	1 %	-	-	-
Preservative	3 ppm	3 ppm	-	3 ppm	-	-
Perfume	0.5 %	0.1	0.1 %	-	-	0.2%
Water	Balance	Balance	Balance	Balance	Balance	Balance

What is claimed is:

1. A fabric wrinkle reducing composition comprising a lubricant, preferably a water-soluble one, and a component having a deviation of fabric Wrinkle Recovery angle (WRA) versus water of at least +15.
2. A composition according to Claim 1, wherein the water-soluble lubricant is selected from nonionic silicone containing surfactants and ethoxylated sorbitan esters.
3. A composition according to either one of Claim 1 or 2, wherein the water-soluble lubricant is present in an amount of from 0.1% to 70% by weight of the composition.
4. A composition according to any one of Claims 1-3, wherein the component having a deviation of fabric WRA versus water of at least 15 is a material, selected from the group consisting of shape retention polymers, polymers comprising at least one unit which provide a dye transfer inhibiting benefit, urethane polymers, isomalto oligosaccharide, polyvinylamine polymers, amphoteric polymers, aminosilicones, curable silicones and mixtures thereof.
5. A composition according to any one of Claims 1-4, wherein the component having a deviation of fabric WRA versus water of at least +15 is present in an amount of at least about 0.01%, preferably from about 0.1% to about 20%, preferably to about 10% by weight of the composition.
6. A composition according to any one of Claims 1-5, wherein the water-soluble lubricant and the component having a deviation of fabric WRA versus water of at least +15 are present in a weight ratio of from 10:1 to 1:1.
7. A composition according to any one of Claims 1-6, wherein the composition is a liquid composition, preferably a liquid aqueous composition.
8. An article of manufacture comprising a composition according to any of Claims 1-7, wherein the article is selected from an aerosol, a spray

dispenser, an iron, a foam dispenser or a refill or a cartridge for an aerosol, a spray dispenser or, an iron or a foam dispenser.

9. The article of manufacture of Claim 8 wherein said article is a spray dispenser selected from spray dispenser comprising battery operated pump, spray dispenser comprising a trigger spray device, spray dispenser comprising a pressurized aerosol spray dispenser, spray dispenser comprising a non-manually operated spray dispenser.
10. A method for treating the fabrics which comprises the steps of contacting the fabric with a water-soluble lubricant or composition according to any one of Claims 1-9 and preferably subsequently curing the fabric.
11. A method according to Claim 10, wherein said method provides a reduction of the time and/or effort involved to iron fabrics.
12. A method according to either one of Claim 10 or 11, wherein said method increases the fabric WRA.
13. A method according to either one of Claim 10-12, wherein said method provides in-wear resistance to treated fabrics.
14. A method according to any one of Claims 10-13, wherein said method is performed in an in-home dewrinkling apparatus.
15. A method according to any one of Claims 10-13, wherein said composition is sprayed onto said fabric, and said fabric is ironed.
16. An article of manufacture comprising a container and the composition of any one of Claims 1-7 in association with instructions to use an effective amount of said composition on fabric to provide at least one benefit selected from the group consisting of: reducing wrinkles; reducing the time and/or effort involved to iron fabrics, imparting in-wear resistance to fabrics.
17. Use of a composition according to Claims 1-7, or cartridge according to Claim 8, in an iron for treating fabrics.

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(54) Title: **WRINKLE RESISTANT COMPOSITION**

(57) Abstract: There is provided a composition comprising a lubricant, preferably a water-soluble one, and components having a deviation of fabric wrinkle recovery angle versus water of at least +15, whereby the combination imparts in-wear wrinkle resistance to the fabric treated therewith.

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☒ Patent family members are listed in annex

*& document member of the same patent family

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INTERNATIONAL SEARCH REPORT

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(54) Title: WRINKLE RESISTANT COMPOSITION

(57) Abstract: There is provided a wrinkle reducing composition comprising a cross-linking resin having the property of being cationic and a component having the property of being co-cross linked with the resin and/or a component comprising at least one unit which provides a dye transfer inhibiting benefit; and article of manufacture thereof. Also herein provided are methods of treating fabrics for imparting various benefits including reducing wrinkles; improving the natural drape of fabrics, imparting a crisp finish to fabrics, reducing the time and/or effort involved to iron fabrics, imparting crease resistance to fabrics, imparting post wash wrinkle resistance to fabrics, imparting in-wear wrinkle resistance to fabrics, imparting a reduction of the fabric aging upon multiple application.

WRINKLE RESISTANT COMPOSITION

Technical field of the invention

The present invention relates to fabric care compositions and to a method for treating fabrics in order to improve various properties of fabrics, in particular, wrinkle resistance.

Background of the invention

Wrinkles in textile fabrics are caused by the bending and creasing of the textile material which places an external portion of a filament in a yarn under tension while the internal portion of that filament in the yarn is placed under compression. Particularly with cotton fabrics, the hydrogen bonding that occurs between the cellulose molecules contributes to keeping wrinkles in place. The wrinkling of fabric, in particular clothing, is therefore subject to the inherent tensional elastic deformation and recovery properties of the fibers which constitute the yarn and fabrics.

In the modern world, with the increase of hustle and bustle and travel, there is a demand for a quick fix which will help to diminish the labor involved in home laundering and/or the cost and time involved in dry cleaning or commercial

laundrying. Further, it is well known that alternating cycles of using and laundrying fabrics and textiles, such as articles of worn clothing and apparel, will inevitably adversely affect the appearance and integrity of the fabric and textile items so used and laundryed. Fabrics and textiles simply wear out over time and
5 with use. Laundrying of fabrics and textiles is necessary to remove soils and stains which accumulate therein and thereon during ordinary use. However, the laundrying operation itself, over many cycles, can accentuate and contribute to the deterioration of the integrity and the appearance of such fabrics and textiles. Accordingly, this has brought additional pressure to bear on textile technologists
10 to produce a product that will sufficiently reduce wrinkles in fabrics, especially clothing, and to produce a good appearance through a simple, convenient application of a product.

The prior art contains numerous examples of compositions for reducing wrinkles.
15 U.S. 5,532,023, discloses aqueous wrinkle control compositions containing non-volatile silicone and film forming polymer. Preferred silicones include reactive silicones and amino-functional silicone, known as "aminodimethicone". The composition containing such silicones is applied to fabric from a spray dispenser. It is found that in the spray treatment, an appreciable amount of the aqueous
20 composition misses the fabric, and instead falls on flooring surfaces, such as rugs, carpets, concrete floors, tiled floors, linoleum floors, bathtub floors, which leaves a silicone layer that is accumulated on and/or cured on and/or bonded to the flooring surfaces. Such silicones that are accumulated on such surfaces, and especially those that are bonded to such surfaces are difficult to remove.
25 Flooring surfaces thus become slippery and can present a safety hazard to the household members. U.S. 5,573,695 discloses an aqueous wrinkle removal composition containing a vegetable oil based cationic quaternary ammonium surfactant, and an anionic fluorosurfactant. Similarly, U.S. 4,661,268 discloses a wrinkle removal spray comprising an aqueous alcoholic composition containing a
30 dialkyl quaternary ammonium salt and a silicone surfactant and/or a fluoro surfactant. U.S. 5,100,566 discloses a method of reducing wrinkles in fabric by spraying the fabric with an aqueous alcoholic solution of an anionic silicate alkali metal salt. U.S. 4,806,254 discloses fabric wrinkle removal aqueous alcoholic solution containing glycerine and a nonionic surfactant. WO98/04772
35 provides the treatment of fabric against fabric creasing by application of a composition comprising a polycarboxylic acid or derivative thereof; and then

curing the composition using a domestic process. These patents are incorporated herein by reference.

- Accordingly, the domestic treatment of fabric is a problem known in the art to the
15 formulator of laundry compositions.

In addition, the problem of wrinkle reduction in industrial field is known in the art. Hence, processes for the industrial durable press treatment of textile fabrics were first introduced in the 1960's and have achieved widespread use since that time.
10 These durable press treatment processes typically involve treating the fibers of the textile fabrics with cross-linking agents. Early durable press processes used formaldehyde as a cross-linking agent which, although effective, was highly odorous and undesirable to the consumer.

- 15 As a consequence, formaldehyde was replaced by reactive resins such as dimethylol urea (DMU), dimethylol ethylene urea (DMEU), and by modified ethylene urea resins, such as dimethylol dihydroxy ethylene urea (DMDHEU). However, still it is known that the desired increases in the durable press performance through the use of cross-linking agents are sometimes
20 accompanied by undesirable losses in other important fabric properties, such as tensile strength, tear strength, abrasion resistance and fabric hand.

Further, solutions obtained from industry are not usually transposable to domestic treatments. Indeed, in industrial processes a strict control over parameters such
25 as pH, electrolyte concentration, water hardness, temperature, etc.. is possible whereas in a domestic washing machine, such a high level of control is not possible. One typical example is given in GB-2,185,499, which provides the use of a polyamide-epichlorhydrin resin in a dip-pad industrial process wherein the polymer is used in the presence of an acrylic polymer. However, such a
30 composition would not be suitable for conventional domestic process involving a curing step, like ironing. Indeed, it has been found that acrylic polymer in presence of the polyamide-epichlorhydrin resin forms precipitates, thereby leaving undesirable residues on the treated fabrics.

- 35 In addition, domestic durable press treatments require conditions that industrial treatments do not have to fulfill. Hence, for domestic durable treatments, the

compounds or compositions thereof need to manifest at least one of the following properties:

5 i)-provide a low level of aldehyde; indeed aldehyde based cross-linker technologies are less favoured in domestic process from an environmental and safety standpoint because contrary to industry where the process is controlled, in domestic process the consumer is the only person using the product, thus enabling the possibility of misuse. Further, high levels of aldehyde tends to produce an odour which would deter the consumer from using it again. Thus, it is
10 desired to provide durable processes for use in domestic process which are safe to the consumer and provide a good odour acceptance;

15 ii)-provide a low or even no tensile strength loss; again as stated above for i), the control of the process in domestic treatment is less measurable. Further, contrary to industry where the fabrics are treated once, domestic treatment involves repeated usage and thus produce a tensile strength loss. Thus, it is desired to provide durable processes for use in domestic process which provide a low or even no tensile strength loss;

20 iii)-be usable at low temperature; indeed in a domestic process, and in particular in a domestic rinse process, it is not practical to rely on high treatment temperatures such as those used in industrial processes. Thus, it is also a further desire of domestic durable press to provide a better performance at low temperatures. Indeed, industry usually achieves a better performance by close
25 control of the reaction process and its various parameters involved; whereas in domestic treatment this close control cannot be achieved. Consequently, the performance of the durable press process needs mostly to be achieved by use of efficient technology, instead of process features;

30 iv)-be applicable in rinse applications as well as in other domestic treatment like laundry machine, soaking, pre-treatment: in such type of application, easier control of the use of the product is achieved, thereby avoiding misuse. Thus, for domestic treatment, the technology involved in the durable press process needs preferably to be suitable for use in one of such application.

35

and/or

v)-not provide stiffness to fabrics. Again, as described for ii), the repeated usage that are involved in domestic treatment may also lead to stiff fabric. Accordingly, it is desired to provide durable press process which reduces such negative.

5

In addition to the above, industrial processes use high concentrations of cross-linking agents which is required for industrial scale treatment whilst for domestic treatment a low level is most preferred for economical reasons.

- 10 Accordingly, notwithstanding the advances in the art, there is still a need for an efficient and economical composition which provides effective domestic durable press properties on the treated fabrics.

- 15 Recently, a new class of materials, namely the polyamide-epichlorhydrin resins, conventionally known in the paper industry under the tradename Kymene, have found increasing use in the domestic treatment of fabrics in order to provide durable press benefits. One typical disclosure is given in co-pending European patent application No. 98870173. That application also exemplifies a combination of 15% polyamide/polyamine/epichlorhydrin polymers (Kymene polymers) with
20 5% polyethylene imine with 7 ethoxylations. In addition, polyamide-epichlorhydrin resins are known for use in industrial treatment, but with the disadvantages highlighted above.

- 25 It has now surprisingly been found that a cross-linking resin having the property of being cationic, in particular polyamide-epichlorhydrin resins, are stabilized in the presence of a component having the property of being co-cross linkable with the resin and/or a component, preferably polymer, comprising at least one unit which provides a dye transfer inhibiting benefit. Not to be bound by any theory, it is believed that by the addition of such polymer, electrostatic interactions
30 between the cationic group of the resin and the polar group of the polymer occur thereby resulting in a so-called "polyelectrolyte complex". As a result, a synergistic benefit on crease resistance as well as on fabric appearance like better dewrinkling, better colour protection, and/or reduced abrasion is observed.

- 35 Still surprising, it has also been found that the use of this combination shows a synergistic increase performance as to the crease resistance and fabric

crispness/hand on the treated fabrics. Further, by use of this compositions, conditions i) to v) are still fulfilled.

Accordingly, the present invention reduces wrinkles in fabrics, including clothing, dry cleanables, linens, bed clothes, and draperies, by ironing. The present invention can be used on damp or dry clothing to relax wrinkles and give clothes a ready to wear or use look that is demanded by today's fast paced world.

In a preferred aspect, an additional benefit of the composition of the present invention is an improved garment shape, body and crispness.

The composition of the present invention acts as an excellent ironing aid. The present invention makes the task of ironing easier and faster by creating less iron drag. The compositions of the present invention help produce a crisp, smooth appearance.

Summary of the invention

The present invention is a wrinkle reducing composition comprising:

a)-a cross-linking resin having the property of being cationic; and

b)-a component having the property of being co-cross linkable with the resin and/or a component comprising at least one unit which provides a dye transfer inhibiting benefit;

with the proviso that when the cross-linking resin is a polyquaternary amine resin of the polyamide/polyamine/epichlorhydrin type present in amount of 15% by weight, the amino functional polymer is not a polyethylene imine with 7 ethoxylations present in amount of 5% by weight.

In another aspect of the invention, there is provided an article of manufacture comprising the composition of the invention.

Still in a further aspect of the invention, there is provided a method of treating fabrics for imparting benefits selected from the group consisting of: reducing

- wrinkles; improving the natural drape of fabrics, imparting a crisp finish to fabrics, reducing the time and/or effort involved to iron fabrics, imparting crease resistance to fabrics, i.e. imparting post wash wrinkle resistance to fabrics as well as imparting in-wear wrinkle resistance to fabrics, imparting a reduction of the fabric aging upon multiple application. By "post wash wrinkle resistance" it is meant, wrinkle resistance during several laundry cycles; by "in-wear wrinkle resistance" it is meant, wrinkle resistance during wear of the garments and by "fabric aging" it is meant color loss, abrasion, pilling or fuzzing of the fabric
- 10 In a further aspect of the invention, there is provided an article of manufacture comprising a container and the composition of the invention in association with instructions to use.

15

Detailed description of the invention

1)-Cross-linking resin having the property of being cationic

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- An essential component of the invention is a cross-linking resin having the property of being cationic. By "cross-linking resin having the property of being cationic", it is meant that the resin is at least partially positively charged. It is not however necessary that the reactive part of the molecule carries the positive charge. Indeed, polymeric resins can be based on positively charged monomers which help the deposition on the fibers. Since the cross-linking resins are negatively charged cellulosic fibers when these resins are added to the final rinse of a laundry process.

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- Cross-linking resins having the property of being cationic suitable for use herein are those commonly known as having wet strength in the paper field. At least two mechanisms have been postulated to account for the mechanism by which wet strength resin act. One is that wet strength resins form covalent bonds between adjacent fibers while another is that the wet strength resin places a layer over the

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hydrogen bonds formed between adjacent paper fibers and thus prevents water from breaking the hydrogen bonds.

Conventional wet-strength agents suitable for use herein include compounds
5 made of epichlorohydrin adducts of polyamine resins, polyethylenimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, amine-aldehyde resins such as melamine-formaldehyde resin, amide-aldehyde resins, and mixtures thereof. For use within the meaning of the present invention, there can also be used materials of the above-mentioned classes of substances
10 which admittedly do not themselves possess any outstanding wet-strength properties but, nevertheless, have the same durable press effect as do the wet-strength agents as described therein.

Among the class of epichlorohydrin adducts of polyamine resins,
15 polyethylenimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, the preferred components are the polymeric amine-epichlorohydrin resins selected from the group consisting of a polyamide-epichlorohydrin (PAE) resin, a polyalkylenepolyamine-epichlorohydrin (PAPAE) resin, and an amine polymer-epichlorohydrin (APE) resin, in which the amine
20 groups have been alkylated with epichlorohydrin to produce a polyamine-epichlorohydrin resin that has azetidinium or epoxide functionality. Preferably, for use herein, the cross-linking resin having cationic properties is a cationic wet strength resin that is produced by reacting a saturated aliphatic dicarboxylic acid containing three to ten carbon atoms with a polyalkylenepolyamine, containing
25 from two to four ethylene groups, two primary amine groups, and one to three secondary amine groups (such as diethylenetriamine, triethylenetetramine and tetraethylenepentamine), to form a poly(aminoamide) having secondary amine groups that are alkylated with epichlorohydrin to form a PAE resin.

30 These polyamide/polyamine/epichlorohydrin wet-strength resins are fully described by Carr, Doane, Hamerstrand and Hofreiter, in an article appearing in the Journal of Applied Polymer Science Vol. 17, pp. 721-735 (1973). Such resins are available as KYMENE from Hercules, Inc. A commercial synthesis of such resins from adipic acid, diethylene triamine and epichlorohydrin is described in
35 the Carr et al publication, *ibid.*, and is U.S. Pat. No. 2,926,154 (Feb. 23, 1960) to G. I. Keim or US 4,240,995. Reference can be made to these publications for

further details regarding the preparation of polyamide/polyamine/epichlorohydrin resins.

- Most preferred cross-linking resin having cationic properties from this class are the wet strength resin Kymene 557H (available from Hercules Incorporated), in which adipic acid is reacted with diethylenetriamine to form a poly(aminoamide) that is alkylated and crosslinked with epichlorohydrin to form a PAE resin. Still another preferred cross-linking resin having cationic properties made of epichlorohydrin are Luresin.RTM and Etadurin which both are polyamidoamine-epichlorohydrin resins.

- Amine-aldehyde resins are suitable cross-linking resins for the present invention and are made by condensation of amine or amide monomers with aldehydes such as formaldehyde or glyoxal. Preferred amines are those having low molecular weight amines e.g. melamine or polymeric amines e.g. polydiallylamine, preferably quarternized. Preferred amides are those polymeric amides such as polyacrylamide. All these suitable amine/amide monomers can also be copolymerized with cationic monomers.
- Among the class of amine-aldehyde cross-linking resin, preferred are those from the class of melamine-formaldehyde resin. Melamine-formaldehyde resins of this type are known as crosslinking agents of this type in the coating industry and are also described, for example, in German Auslegeschrift Nos. 2,457,387 (U.S. Pat. No. 4,035,213 incorporated herein by reference) and 1,719,324 and, in particular, in U.S. Pat. No. 3,242,230 incorporated herein by reference.

Preferred melamine-formaldehyde resin are those commercially available under the tradenames Madurit, and Cassurit from Clariant.

- Still other preferred cross-linking resin having the property of being cationic among the class of amine-aldehyde cross-linking resin are the Poly(acrylamide-glyoxal) resin commercially available under the tradename SOLIDURIT KM from Clariant.
- According to the present invention, there can also be used a mixture of wet-strength agents of the above-mentioned types or equivalent compounds.

Preferably for the purpose of the invention, the cross-linking resin having cationic properties have a molecular weight between 200 and 1,000,000, preferably between 500 and 100,000, most preferably between 1000 and 25,000. Cross-linking resin having a low molecular weight are most preferred for use in the present invention as they are more water-soluble and have a better fiber penetration. By low molecular weight it is meant a molecular weight within the range of from 25 to 2000, preferably from 50 to 1000, and more preferably from 50 to 500.

The above cross-linking components may be used in a composition for delivery onto fabric, such as by means of a spray process.

It is desirable if the level of cross-linking components or derivative thereof is present in an amount of from 0.01% to 60%, preferably from 0.1% to 30% by weight of the total composition. Typically, the level of cross-linking component is present in the composition in a sufficient amount to result in an amount of from 0.01% to 60%, preferably of from 0.1 to 30%, by weight of cross-linking component per weight of dry fabrics.

It is advantageous for aldehyde containing cross-linking resins if a catalyst is used with compositions of the invention. Preferred catalysts includes organic acids such as citric acid, succinic acid, and tartaric acids, as well as conventional Lewis acid such as $AlCl_3$ or $MgCl_2$, or salts thereof, or mixtures thereof. A typical example of catalyst is the catalyst NKD made of a mixture of salts and organic acid, and commercially available from Hoechst.

It is preferred if the level of catalyst is from 10% to 50%, preferably from 20 to 40% by weight of the cross-linking components or derivative thereof.

For other cross-linking resins like the Kymene, the use of a catalyst is not necessary.

2)-Component having the property of being co-cross linkable with the resin and/or a component comprising at least one unit which provides a dye transfer inhibiting benefit

A component having the property of being co-cross linkable with the resin and/or a component comprising at least one unit which provides a dye transfer inhibiting benefit are also essential components of the invention. By use of this component(s) with the resin, a synergistic increase in performance as to the crease resistance and fabric crispness/hand on the treated fabrics is obtained, in particular from duration standpoint. Indeed, the obtained benefits from a one-shot treatment have been shown to sustain over multiple wash cycles, e.g. of about 20 wash cycles. Of course, the treatment with the invention composition can still be effected after each wash cycle, thereby further increasing the duration of the benefit treatment, even while wearing. Still, the use of that type of component having the property of being co-cross linkable with the resin or a component comprising at least one unit which provides a dye transfer inhibiting benefit has been found particularly beneficial to the stability of the resin, in particular those that are made of polyquaternary amine resins. Indeed, a clear homogenous solution is obtained.

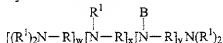
Preferred components having the property of being co-cross linkable with the resin are selected from polyamine polymers, amino-functional silicones, alkyl amines, and mixtures thereof.

The compositions of the present invention typically comprise from about 0.01%, preferably from about 0.1% to about 20%, preferably to about 10% by weight, of a component having the property of being co-cross linkable with the resin and/or a component comprising at least one unit which provides a dye transfer inhibiting benefit.

Polyamine polymers

Polyamine polymers are suitable amino-functional polymers for use herein.

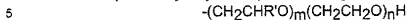
A preferred polyamine polymer has the formula:



wherein R, R¹ and B are suitably described in U.S. 5,565,145 Watson et al., issued October 15, 1996 incorporated herein by reference, and w, x, and y have

values which provide for a backbone prior to substitution of preferably at least about 1200 daltons, more preferably 1800 daltons.

R¹ units are preferably alkyleneoxy units having the formula:



wherein R' is methyl or ethyl, m and n are preferably from about 0 to about 50, provided the average value of alkoxylation provided by m + n is at least about 0.5.

- 10 A further description of polyamine polymers suitable for use in the present invention is found in U.S. 4,891,160 Vander Meer, issued January 2, 1990; U.S. 4,597,898, Vander Meer, issued July 1, 1986; European Patent Application 111,965, Oh and Gosselink, published June 27, 1984; European Patent Application 111,984, Gosselink, published June 27, 1984; European Patent
- 15 Application 112,592, Gosselink, published July 4, 1984; U.S. 4,548,744, Connor, issued October 22, 1985; and U.S. 5,565,145 Watson et al., issued October 15, 1996; all of which are included herein by reference.

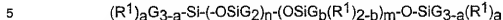
- Preferred polyamines are linear and branched polyethyleneamines commercially available ex BASF under the tradename Lupasol®.
- 20

Amino-functional silicones

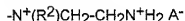
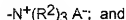
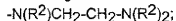
- Amino-functional silicones are also useful components having the property of being co-cross linked with the resin for use herein. Typically, these component
- 25 are conventionally known under the name of silicone lubricant. Preferred aminofunctional silicones are amodimethicone compounds commercially available ex Dow Corning under the tradename DC X (where X is preferably 949 or 939).
- 30 Suitable silicone materials include materials of the formula:
- $$\text{HO}-[\text{Si}(\text{CH}_3)_2\text{O}]_x-[\text{Si}(\text{OH})(\text{CH}_2)_3\text{NH}-(\text{CH}_2)_2\text{NH}_2\text{O}]_y\text{H}$$
- wherein x and y are integers which depend on the molecular weight of the silicone, preferably having a viscosity of from about 10,000 cst to about 500,000 cst at 25°C. This material is also known as "amodimethicone". Although
- 35 silicones with a high number, e.g., greater than about 0.5 millimolar equivalent of

amine groups can be used, they are not preferred because they can cause fabric yellowing.

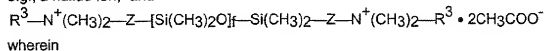
Similarly, silicone materials which can be used correspond to the formulas:



wherein G is selected from the group consisting of hydrogen, phenyl, OH, and/or C₁-C₈ alkyl; a denotes 0 or an integer from 1 to 3; b denotes 0 or 1; the sum of n + m is a number from 1 to about 2,000; R¹ is a monovalent radical of formula C_pH_{2p}L in which p is an integer from 2 to 8 and L is selected from the group consisting of:



wherein each R² is chosen from the group consisting of hydrogen, phenyl, benzyl, saturated hydrocarbon radical, and each A⁻ denotes compatible anion, e.g., a halide ion; and

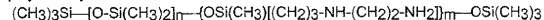


R³ denotes a long chain alkyl group; and

f denotes an integer of at least about 2.

In the formulas herein, each definition is applied individually and averages are included.

Another silicone material which can be used, but is less preferred than polydimethyl siloxanes, has the formula:



wherein n and m are the same as before. The preferred silicones of this type are those which do not cause fabric discoloration.

Alternatively, the silicone material can be provided as a moiety, or a part, of a non-silicone molecule. Examples of such materials are copolymers having siloxane macromers grafted thereto, which meet the functional limitations as defined above. That is, the non-silicone backbone of such polymers should have

a molecular weight of from about 5,000 to about 1,000,000, and the polymer should have a glass transition temperature (T_g), i.e., the temperature at which the polymer changes from a brittle vitreous state to a plastic state, of greater than about -20°C.

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Alkyl amines

Alkyl amines are also useful components, consisting of one or more linear or branched alkyl chains covalently linked onto a nitrogen atom. Preferred, but non-limiting examples of alkyl amines are methyl-, ethyl-, dimethyl-, diethyl-, and triethylamine.

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Polymers comprising at least one unit which provide a dye transfer inhibiting benefit

The preferred polymers comprising at least one unit which provide a dye transfer inhibiting benefit are water-soluble polymers. For the purposes of the present invention the term "water-soluble" is defined as "a polymer which when dissolved in water at a level of 0.2% by weight, or less, at 25° C, forms a clear, isotropic liquid".

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The polymers comprising at least one unit which provide a dye transfer inhibiting benefit useful in the present invention have the formula:

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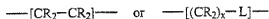


wherein the unit P is a polymer backbone which comprises units which are homopolymeric or copolymeric. D units are defined herein below. For the purposes of the present invention the term "homopolymeric" is defined as "a polymer backbone which is comprised of units having the same unit composition, i.e., formed from polymerization of the same monomer". For the purposes of the present invention the term "copolymeric" is defined as "a polymer backbone which is comprised of units having a different unit composition, i.e., formed from the polymerization of two or more monomers".

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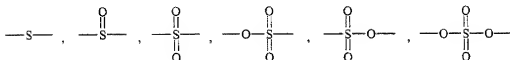
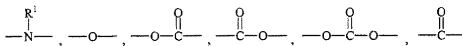
P backbones preferably comprise units having the formula:



wherein each R unit is independently hydrogen, C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and D units as described herein below; preferably C₁-C₄ alkyl.

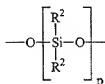
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Each L unit is independently selected from heteroatom-containing moieties, non-limiting examples of which are selected from the group consisting of:



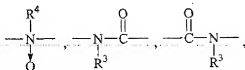
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polysiloxane having the formula:



wherein the index p is from 1 to about 6; units which have dye transfer inhibition activity:

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and mixtures thereof; wherein R¹ is hydrogen, C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof. R² is C₁-C₁₂ alkyl, C₁-C₁₂ alkoxy, C₆-C₁₂ aryloxy, and mixtures thereof; preferably methyl and methoxy. R³ is hydrogen C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof; preferably hydrogen or C₁-C₄ alkyl, more preferably hydrogen. R⁴ is C₁-C₁₂ alkyl, C₆-C₁₂ aryl, and mixtures thereof.

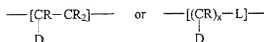
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The backbones of the polymers of the present invention comprise one or more D units which are units which comprise one or more units which provide a dye transfer inhibiting benefit. The D unit can be part of the backbone itself as represented in the general formula:



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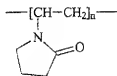
or the D unit may be incorporated into the backbone as a pendant group to a backbone unit having, for example, the formula:



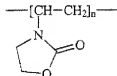
- However, the number of D units depends upon the formulation. For example, the number of D units will be adjusted to provide water solubility of the polymer as well as efficacy of dye transfer inhibition. The molecular weight of the polymers of the present invention are from about 500, preferably from about 1,000, more preferably from about 10,000 to about 6,000,000, preferably to about 2,000,000, more preferably to about 1,000,000, yet more preferably to about 500,000, most preferably to about 360,000 daltons. Therefore the value of the index n is selected to provide the indicated molecular weight, and providing for a water solubility of at least 100 ppm, preferably at least about 300 ppm, and more preferably at least about 1,000 ppm in water at ambient temperature which is defined herein as 25°C.

15 Polymers Comprising Amide Units

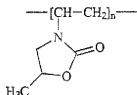
Non-limiting examples of preferred D units are D units which comprise an amide moiety. Examples of polymers wherein an amide unit is introduced into the polymer via a pendant group includes polyvinylpyrrolidone having the formula:



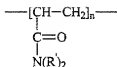
- 20 polyvinylloxazolidone having the formula:



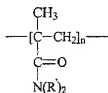
polyvinylmethyloxazolidone having the formula:



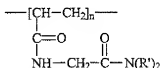
- 25 polyacrylamides and N-substituted polyacrylamides having the formula:



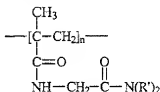
- wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; polymethacrylamides and N-substituted polymethacrylamides having the general formula:



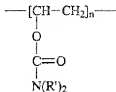
- wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; poly(N-acrylylglycinamide) having the formula:



- wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; poly(N-methacrylylglycinamide) having the formula:

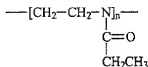


- wherein each R' is independently hydrogen, C₁-C₆ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms; polyvinylurethanes having the formula:



wherein each R' is independently hydrogen, C₁-C₈ alkyl, or both R' units can be taken together to form a ring comprising 4-6 carbon atoms.

- 5 An example of a D unit wherein the nitrogen of the dye transfer inhibiting moiety is incorporated into the polymer backbone is a poly(2-ethyl-2-oxazoline) having the formula:



wherein the index n indicates the number of monomer residues present.

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- The amino-functional polymers of the present invention can comprise any mixture of dye transfer inhibition units which provides the product with suitable properties. The preferred polymers which comprise D units which are amide moieties are those which have the nitrogen atoms of the amide unit highly substituted so the nitrogen atoms are in effect shielded to a varying degree by the surrounding non-polar groups. This provides the polymers with an amphiphilic character. Non-limiting examples include polyvinyl-pyrrolidones, polyvinylloxazolidones, N,N-disubstituted polyacrylamides, and N,N-disubstituted polymethacrylamides. A detailed description of physico-chemical properties of some of these polymers are given in "Water-Soluble Synthetic Polymers: Properties and Behavior", Philip Molyneux, Vol. I, CRC Press, (1983) included herein by reference.

- The amide containing polymers may be present partially hydrolyzed and/or crosslinked forms. A preferred polymeric compound for the present invention is polyvinylpyrrolidone (PVP). This polymer has an amphiphilic character with a highly polar amide group conferring hydrophilic and polar-attracting properties, and also has non-polar methylene and methine groups, in the backbone and/or the ring, conferring hydrophobic properties. PVP is readily soluble in aqueous and organic solvent systems. PVP is available ex ISP, Wayne, New Jersey, and BASF Corp., Parsippany, New Jersey, as a powder or aqueous solutions in several viscosity grades, designated as, e.g., K-12, K-15, K-25, and K-30. These K-values indicate the viscosity average molecular weight, as shown below:

PVP viscosity average molecular weight (in thousands of daltons)	K-12	K-15	K-25	K-30	K-60	K-90
	2.5	10	24	40	160	360

- PVP K-12, K-15, and K-30 are also available ex Polysciences, Inc. Warrington, Pennsylvania, PVP K-15, K-25, and K-30 and poly(2-ethyl-2-oxazoline) are available ex Aldrich Chemical Co., Inc., Milwaukee, Wisconsin. PVP K30 (40,000) through to K90 (360,000) are also commercially available ex BASF under the tradename Luviskol or commercially available ex ISP. Still higher molecular PVP like PVP 1.3MM, commercially available ex Aldrich is also suitable for use herein. Yet further PVP-type of material suitable for use in the present invention are polyvinylpyrrolidone-co-dimethylaminoethylmethacrylate, commercially available ex ISP in a quaternised form under the tradename Gafquat® or commercially available ex Aldrich Chemical Co. having a molecular weight of approximately 1.0MM; polyvinylpyrrolidone-co-vinyl acetate, available ex BASF under the tradename Luviskol®, available in vinylpyrrolidone:vinylacetate ratios of from 3:7 to 7:3; polyvinylpyrrolidone-co-vinylimidazoliumquat, commercially available ex BASF under the tradename Luviquat®.

Polymers Comprising N-oxide Units

- Another D unit which provides dye transfer inhibition enhancement to the polymers described herein, are N-oxide units having the formula:



- wherein R^1 , R^2 , and R^3 can be any hydrocarbyl unit (for the purposes of the present invention the term "hydrocarbyl" does not include hydrogen atom alone). The N-oxide unit may be part of a polymer, such as a polyamine, i.e., polyalkyleneamine backbone, or the N-oxide may be part of a pendant group attached to the polymer backbone. An example of a polymer which comprises the N-oxide unit as a part of the polymer backbone is polyethyleneimine N-oxide. Non-limiting examples of groups which can comprise an N-oxide moiety include the N-oxides of certain heterocycles *inter alia* pyridine, pyrrole, imidazole,

pyrazole, pyrazine, pyrimidine, pyridazine, piperidine, pyrrolidine, pyrrolidone, azolidine, morpholine. A preferred polymer is poly(4-vinylpyridine N-oxide, PVNO). In addition, the N-oxide unit may be pendant to the ring, for example, aniline oxide.

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N-oxide comprising polymers of the present invention will preferably have a ration of N-oxidized amine nitrogen to non-oxidized amine nitrogen of from about 1:0 to about 1:2, preferably to about 1:1, more preferably to about 3:1. The amount of N-oxide units can be adjusted by the formulator. For example, the formulator may co-polymerize N-oxide comprising monomers with non N-oxide comprising monomers to arrive at the desired ratio of N-oxide to non N-oxide amino units, or the formulator may control the oxidation level of the polymer during preparation. The amine oxide unit of the polyamine N-oxides of the present invention have a Pk_a less than or equal to 10, preferably less than or equal to 7, more preferably less than or equal to 6. The average molecular weight of the N-oxide comprising polymers which provide a dye transfer inhibitor benefit to polymers is from about 500 daltons, preferably from about 1,000 daltons, more preferably from about 10,000 daltons to about 6,000,000 daltons, preferably to about 2,000,000 daltons, more preferably to about 360,000 daltons.

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Polymers Comprising Amide Units and N-oxide Units

A further example of polymers which have dye transfer inhibition benefits are polymers which comprise both amide units and N-oxide units as described herein above. Non-limiting examples include co-polymers of two monomers wherein the first monomer comprises an amide unit and the second monomer comprises an N-oxide unit. In addition, oligomers or block polymers comprising these units can be taken together to form the mixed amide/N-oxide polymers. However, the resulting polymers must retain the water solubility requirements described herein above.

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More preferably, the resin and the component capable of being co-cross-linked with the resin and/or of being amphiphilic are present in weight ratios of from 20:1 to 1:1, most preferably from 10:1 to 1:1. Within these ratio ranges, it has been found that above mentioned polymers or mixtures thereof, in combination with the polyamide-epichlorohydrin resins, show a synergistic increase performance as to the crease resistance and fabric crispness/hand on the treated fabrics.

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Optionals

The composition of the invention may also comprises one or more of the following optional ingredients.

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1)-Other additional fiber Lubricant

The present invention may use fiber lubricants to impart a lubricating property, or increased gliding ability, to fibers in fabric, particularly clothing. Not to be bound by theory, it is believed that water and other alcoholic solvents break, or weaken, the hydrogen bonds that hold the wrinkles in fabric, and fabric lubricants facilitate the movement of fibers with respect to one another (glide) to further release the fibers from the wrinkle condition in wet or damp fabrics. After the fabric is dried, the residual fiber lubricant, especially silicone, can provide lubricity to reduce the tendency of fabric to rewrinkle.

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(a). Silicone

The present invention can use silicone, a preferred fiber lubricant, to impart a lubricating property, or increased gliding ability, to fibers in fabric, particularly clothing. Nonlimiting examples of useful silicones in the composition of the present invention include noncurable silicones such as polydimethylsilicone and volatile silicones, and curable silicones such as aminosilicones, phenylsilicones and hydroxysilicones. The word "silicone" as used herein preferably refers to water soluble as well as emulsified silicones, including those that are commercially available and those that are emulsified in the composition, unless otherwise described. Preferably, the silicones are hydrophilic; are neither irritating, toxic, nor otherwise harmful when applied to fabric or when they come in contact with human skin; are chemically stable under normal use and storage conditions; and are capable of being deposited on fabric.

A preferred class of nonionic silicone containing surfactants are the polyalkylene oxide polysiloxanes having a dimethyl polysiloxane hydrophobic moiety and one or more hydrophilic polyalkylene side chains, and having the general formula:

$$R1-(CH_3)_2SiO-[(CH_3)_2SiO]_a-[(CH_3)(R1)SiO]_b-Si(CH_3)_2-R1$$
 wherein $a + b$ are from about 1 to about 50, preferably from about 1 to about 30, more preferably from about 1 to about 25, and each R1 is the same or different

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and is selected from the group consisting of methyl and a poly(ethyleneoxide/propyleneoxide) copolymer group having the general formula:
 $-(CH_2)_n O(C_2 H_4 O)_c (C_3 H_6 O)_d R_2$

- with at least one R1 being a poly(ethyleneoxy/propyleneoxy) copolymer group,
 5 and wherein n is 3 or 4, preferably 3; total c (for all polyalkyleneoxy side groups) has a value of from 1 to about 100, preferably from about 6 to about 100; total d is from 0 to about 14, preferably from 0 to about 3; and more preferably d is 0; total c+d has a value of from about 5 to about 150, preferably from about 7 to about 100 and each R2 is the same or different and is selected from the group
 10 consisting of hydrogen, an alkyl having 1 to 4 carbon atoms, and an acetyl group, preferably hydrogen and methyl group. Each polyalkylene oxide polysiloxane has at least one R1 group being a poly(ethyleneoxide/propyleneoxide) copolymer group.

- 15 Nonlimiting examples of this type of surfactants are the Silwet® surfactants which are available OSI Specialties Inc., a Division of Witco, Danbury, Connecticut. Representative Silwet® surfactants which contain only ethyleneoxy (C2H4O) groups are as follows.

	Name	Average MW	Average a+b	Average total c
20	L-7608	600	1	8
	L-7607	1,000	2	17
	L-77	600	1	9
	L-7605	6,000	20	99
	L-7604	4,000	21	53
25	L-7600	4,000	11	68
	L-7657	5,000	20	76
	L-7602	3,000	20	29
	L-7622	10,000	88	75

- 30 Nonlimiting examples of Silwet® surfactants which contain both ethyleneoxy (C2 H4 O) and propyleneoxy (C3 H6 O) groups are as follows.

	Name	Average MW	EO/PO ratio
	L-720	12,000	50/50
	L-7001	20,000	40/60
35	L-7002	8,000	50/50
	L-7210	13,000	20/80

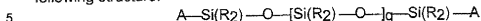
L-7200	19,000	75/25
L-7220	17,000	20/80

5 The molecular weight of the polyalkyleneoxy group (R1) is less than or equal to about 10,000. Preferably, the molecular weight of the polyalkyleneoxy group is less than or equal to about 8,000, and most preferably ranges from about 300 to about 5,000. Thus, the values of c and d can be those numbers which provide molecular weights within these ranges. However, the number of ethyleneoxy units ($-C_2H_4O$) in the polyether chain (R1) must be sufficient to render the polyalkylene oxide polysiloxane water soluble. If propyleneoxy groups are present in the polyalkyleneoxy chain, they can be distributed randomly in the chain or exist as blocks. Surfactants which contain only ethyleneoxy groups without propyleneoxy groups are preferred. Mixtures of Silwet® surfactants, in particular of Silwet surfactants which contain only propyleneoxy groups and Silwet surfactants which contain both ethyleneoxy and propyleneoxy groups, are also preferred. Preferred Silwet® surfactants are the L-7001, L-7087, L-7200, L-7280, L-7600, L-7608, L-7622, L-7657.

20 The preparation of polyalkylene oxide polysiloxanes is well known in the art. Polyalkylene oxide polysiloxanes of the present invention can be prepared according to the procedure set forth in U.S. Pat. No. 3,299,112, incorporated herein by reference. Typically, polyalkylene oxide polysiloxanes of the surfactant blend of the present invention are readily prepared by an addition reaction between a hydrosiloxane (i.e., a siloxane containing silicon-bonded hydrogen) and an alkenyl ether (e.g., a vinyl, allyl, or methallyl ether) of an alkoxy or hydroxy end-blocked polyalkylene oxide). The reaction conditions employed in addition reactions of this type are well known in the art and in general involve heating the reactants (e.g., at a temperature of from about 85° C. to 110° C.) in the presence of a platinum catalyst (e.g., chloroplatinic acid) and a solvent (e.g., toluene).

30 Other usefull silicones are volatile silicone fluids which can be cyclic silicone fluid of the formula $[(CH_3)_2SiO]_n$ where n ranges between about 3 to about 7, preferably about 5, or a linear silicone polymer fluid having the formula $(CH_3)_3SiO[(CH_3)_2SiO]_mSi(CH_3)_3$ where m can be 0 or greater and has an average value such that the viscosity at 25°C of the silicone fluid is preferably about 5 centistokes or less.

The non-volatile silicones that are useful in the composition of the present invention is polyalkyl and/or phenylsilicones silicone fluids and gums with the following structure:



The alkyl groups substituted on the siloxane chain (R) or at the ends of the siloxane chains (A) can have any structure as long as the resulting silicones remain fluid at room temperature.

10

Each R group preferably can be alkyl, aryl, hydroxy, or hydroxyalkyl group, and mixtures thereof, more preferably, each R is methyl, ethyl, propyl or phenyl group, most preferably R is methyl. Each A group which blocks the ends of the silicone chain can be hydrogen, methyl, methoxy, ethoxy, hydroxy, propoxy, and
15 aryloxy group, preferably methyl. Suitable A groups include hydrogen, methyl, methoxy, ethoxy, hydroxy, and propoxy. q is preferably an integer from about 7 to about 8,000. The preferred silicones are polydimethyl siloxanes; more preferred silicones are polydimethyl siloxanes having a viscosity of from about 50 to about 1000,000 centistokes at 25°C. Mixtures of volatile silicones and non-
20 volatile polydimethyl siloxanes are also preferred. Suitable examples include silicones offered by Dow Corning Corporation and General Electric Company.

20

When silicone is present, it is present at least an effective amount to provide lubrication of the fibers, typically minimum levels of wrinkle control agent included
25 in the composition are at least about 0.025%, preferably at least about 0.05%, more preferably at least about 0.1%, even more preferably at least about 0.2%, even more highly preferably at least about 0.4%, and most preferably at least about 0.5% and typically maximum levels of wrinkle control composition are about 10%, preferably less than about 5%, more preferably less than about 3%,
30 by weight of the usage composition.

30

(b). Synthetic solid particles

Solid polymeric particles of average particle size smaller than about 10 microns, preferably smaller than 5 microns, more preferably smaller than about 1 micron,
35 e.g., Velustrol® P-40 oxidized polyethylene emulsion available from Clariant, can be used as a lubricant, also Tospearl™ 105, 120, 130, 145, 240 polydimethyl

- siloxane polymers available from GE Silicones, since they can provide a "roller-bearing" action. When solid polymeric particles are present, they are present at an effective amount to provide lubrication of the fibers, typically from about 0.01% to about 3%, preferably from about 0.05% to about 1%, more preferably from about 0.1% to about 0.5%, by weight of the usage composition.

(c). Quaternary Ammonium Compounds

- Although many quaternary ammonium compounds with alkyl substituents are suitable for this composition, quaternary ammonium compounds that contain hydrocarbon groups, including substituted groups and groups that are part of, e.g., acyl groups, which are unsaturated or branched are particularly suited for this composition. In some cases, amine precursors of the quaternary ammonium compounds can themselves be useful in this composition.

- Typical levels of incorporation of the quaternary ammonium compound (active) in the wrinkle composition are of from about 0.025% to about 10% by weight, preferably from about 0.05% to about 5%, more preferably from about 0.1% to about 3%, and even more preferably from about 0.2% to about 2%, by weight of the composition, and preferably is biodegradable as disclosed hereinafter.

- Suitable quaternary ammonium compounds for use in the wrinkle composition have been previously disclosed in U. S. Pat. No. 5,759,990, issued Jun. 2, 1998 in the names of E. H. Wahl, H. B. Tordil, T. Trinh, E. R. Carr, R. O. Keys, and L. M. Meyer, for Concentrated Fabric Softening Composition with Good Freeze/Thaw Recovery and Highly Unsaturated Fabric Softener Compound Therefor, and in U. S. Pat. No. 5,747,443, issued May 5, 1998 in the names of Wahl, Trinh, Gosselink, Letton, and Sivik for Fabric Softening Compound/Composition. An indicator of the suitability of quaternary ammonium actives for use in the compositions of the present invention is the phase transition temperature. Preferably, the phase transition temperature of the quaternary ammonium active or mixture of actives, containing less than about 5% organic solvent or water, is less than about 50°C, more preferably less than about 35°C, even more preferably less than about 20°C, and yet even more preferably less than about 10°C, or is amorphous and has no significant endothermic phase transition in the region from about -50°C to about 100°C.

The phase transition temperature can be measured with a Mettler TA 3000 differential scanning calorimeter with Mettler TC 10A Processor.

- 5 Typical suitable quaternary ammonium compounds or amine precursors are defined hereinafter.

Preferred Diester Quaternary Ammonium Active Compound (DEQA)

- (1) The first type of DEQA preferably comprises, as the principal active, [DEQA (1)] compounds of the formula
- $$\{R_{4-m} - N^+ - [(CH_2)_n - Y - R^1]_m\} X^-$$
- 10

- wherein each R substituent is either hydrogen, a short chain C₁-C₆, preferably C₁-C₃ alkyl or hydroxyalkyl group, e.g., methyl (most preferred), ethyl, propyl, hydroxyethyl, and the like, poly (C₂₋₃ alkoxy), preferably polyethoxy, group, benzyl, or mixtures thereof; each m is 2 or 3; each n is from 1 to about 4, preferably 2; each Y is -O-(O)C-, -C(O)-O-, -NR-C(O)-, or -C(O)-NR-; the sum of carbons in each R¹, plus one when Y is -O-(O)C- or -NR-C(O)-, is C₁₂-C₂₂, preferably C₁₄-C₂₀, with each R¹ being a hydrocarbyl, or substituted hydrocarbyl group, and X⁻ can be any quaternary ammonium-compatible anion, preferably, chloride, bromide, methylsulfate, ethylsulfate, sulfate, and nitrate, more preferably chloride or methyl sulfate (As used herein, the "percent of quaternary ammonium active" containing a given R¹ group is based upon taking a percentage of the total active based upon the percentage that the given R¹ group is, of the total R¹ groups present.);
- 15
20
25

- (2) A second type of DEQA active [DEQA (2)] has the formula:



wherein each Y, R, R¹, and X⁻ have the same meanings as before. Such compounds include those having the formula:

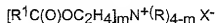
- 30 $[CH_3]_3 N^{(+)}[CH_2CH(CH_2O(O)CR^1)O(O)CR^1] C_1(-)$

wherein each R is a methyl or ethyl group and preferably each R¹ is in the range of C₁₅ to C₁₉. As used herein, when the diester is specified, it can include the monoester that is present. The amount of monoester that can be present is the same as in DEQA (1).

35

These types of agents and general methods of making them are disclosed in U.S. Pat. No. 4,137,180, Naik et al., issued Jan. 30, 1979, which is incorporated herein by reference. An example of preferred DEQA (2) is the "propyl" ester quaternary ammonium active having the formula 1,2-di(acyloxy)-3-trimethylammonio propane chloride, where the acyl is the same as that of FA¹ disclosed hereinafter.

Some preferred wrinkle compositions of the present invention contain as an essential component from about 0.025% to about 10%, preferably from about 0.05% to about 5%, more preferably from about 0.1% to about 3%, and even more preferably from about 0.2% to about 2% by weight of the composition, of quaternary ammonium active having the formula:



wherein each R¹ in a compound is a C₆-C₂₂ hydrocarbonyl group, preferably having an IV from about 70 to about 140 based upon the IV of the equivalent fatty acid with the cis/trans ratio preferably being as described hereinafter, m is a number from 1 to 3 on the weight average in any mixture of compounds, each R in a compound is a C₁₋₃ alkyl or hydroxy alkyl group, the total of m and the number of R groups that are hydroxyethyl groups equaling 3, and X is a quaternary ammonium compatible anion, preferably methyl sulfate. Preferably the cis:trans isomer ratio of the fatty acid (of the C_{18:1} component) is at least about 1:1, preferably about 2:1, more preferably about 3:1, and even more preferably about 4:1, or higher.

These preferred compounds, or mixtures of compounds, have (a) either a Hunter "L" transmission of at least about 85, typically from about 85 to about 95, preferably from about 90 to about 95, more preferably above about 95, if possible, (b) only low, relatively non-detectable levels, at the conditions of use, of odorous compounds selected from the group consisting of: Isopropyl acetate; 2,2'-ethylidenebis(oxy)bis-propane; 1,3,5-trioxane; and/or short chain fatty acid (4-12, especially 6-10, carbon atoms) esters, especially methyl esters; or (c) preferably, both.

The Hunter L transmission is measured by (1) mixing the quaternary ammonium active with solvent at a level of about 10% of active, to assure clarity, the preferred solvent being ethoxylated (one mole EO) 2,2,4-trimethyl-1,3-pentanediol and (2) measuring the L color value against distilled water with a

Hunter ColorQUEST® colorimeter made by Hunter Associates Laboratory, Reston, Virginia.

- The level of odorant is defined by measuring the level of odorant in a headspace over a sample of the quaternary ammonium active (about 92% active).
- 5 Chromatograms are generated using about 200 mL of head space sample over about 2.0 grams of sample. The head space sample is trapped on to a solid absorbent and thermally desorbed onto a column directly via cryofocussing at about -100°C. The identifications of materials is based on the peaks in the chromatograms. Some impurities identified are related to the solvent used in the quaternization process, (e.g., ethanol and isopropanol). The ethoxy and methoxy
- 10 ethers are typically sweet in odor. There are C₆ -C₈ methyl esters found in a typical current commercial sample, but not in the typical quaternary ammonium actives of this invention. These esters contribute to the perceived poorer odor of the current commercial samples. The level of each odorant in ng/L found in the head space over a preferred active is as follows: Isopropyl acetate - < 1; 1,3,5-
- 15 trioxane - < 5; 2,2'-ethylidenebis(oxy)-bispropane - < 1; C₆ methyl ester - < 1; C₈ Methyl ester - < 1; and C₁₀ Methyl ester - < 1.

- The acceptable level of each odorant is as follows: isopropyl acetate should be less than about 5, preferably less than about 3, and more preferably less than
- 20 about 2, nanograms per liter (ng/L.); 2,2'-ethylidenebis(oxy)bis-propane should be less than about 200, preferably less than about 100, more preferably less than about 10, and even more preferably less than about 5, nanograms per liter (ng/L.); 1,3,5-trioxane should be less than about 50, preferably less than about 20, more preferably less than about 10, and even more preferably less than about 7,
- 25 nanograms per liter (ng/L.); and/or each short chain fatty acid (4-12, especially 6-10, carbon atoms) ester, especially methyl esters should be less than about 4, preferably less than about 3, and more preferably less than about 2, nanograms per liter (ng/L.).

- The elimination of color and odor materials can either be accomplished after
- 30 formation of the compound, or, preferably, by selection of the reactants and the reaction conditions. Preferably, the reactants are selected to have good odor and color. For example, it is possible to obtain fatty acids, or their esters, for sources of the long fatty acyl group, that have good color and odor and which have extremely low levels of short chain (C₄-12, especially C₆-10) fatty acyl groups.
- 35 Also, the reactants can be cleaned up prior to use. For example, the fatty acid

reactant can be double or triple distilled to remove color and odor causing bodies and remove short chain fatty acids. Additionally, the color of a triethanolamine reactant, if used, needs to be controlled to a low color level (e.g., a color reading of about 20 or less on the APHA scale). The degree of clean up required is dependent on the level of use, clarity of the product, and the presence of other ingredients. For example, adding a dye or starting with an opaque product can cover up some colors. However, for clear and/or light colored products, the color must be almost non-detectable. This is especially true as the level of the quaternary ammonium compound used in the product goes up. The degree of clean up would be especially important in products sold as concentrates that are intended for dilution by the consumer. Similarly, the odor can be covered up by higher levels of perfume, but as perfume level increases, cost associated with this approach increases too, also many consumers prefer a product with a lighter scent which precludes the approach of using higher perfume levels. Odor quality can be further improved by use of, e.g., ethanol as the quaternization reaction solvent.

Preferred biodegradable quaternary ammonium compounds comprise quaternary ammonium salt, the quaternary ammonium salt being a quaternized product of the condensation reaction between:

- a)-a fraction of saturated or unsaturated, linear or branched fatty acids, or of derivatives of said acids, said fatty acids or derivatives each possessing a hydrocarbon chain in which the number of atoms is between 5 and 21, and
 - b)-triethanolamine,
- characterized in that said condensation product has an acid value, measured by titration of the condensation product with a standard KOH solution against a phenolphthalein indicator, of less than about 6.5.

The acid value is preferably less than or equal to about 5, more preferably less than about 3.

The acid value is determined by titration of the condensation product with a standard KOH solution against a phenolphthalein indicator according to ISO#53402. The Acid Value (AV) is expressed as mg KOH/g of the condensation product.

- These quaternary ammonium compounds for use herein are typically mixtures of materials. The weight percentages of compounds wherein one (monoester), two (diester), or three (triester) of the triethanolamine hydroxy groups is esterified with a fatty acyl group are as follows: Monoester - from about 12% to about 22%; diester - from about 43% to about 57%; and triester - from about 13% to about 28%. These compounds, as formed and used in the formulation of wrinkle compositions, typically contain from about 6% to about 20% by weight of solvent, e.g., from about 3% to about 10% of a lower molecular alcohol like ethanol and from about 3% to about 10% of solvent that is more hydrophobic, like hexylene glycol.

- Preferred cationic, preferably biodegradable, quaternary, ammonium compounds can contain the group $-(O)CR^1$ which is derived from animal fats, unsaturated, and polyunsaturated, fatty acids, e.g., oleic acid, and/or partially hydrogenated fatty acids, derived from vegetable oils and/or partially hydrogenated vegetable oils, such as, canola oil, safflower oil, peanut oil, sunflower oil, corn oil, soybean oil, tall oil, rice bran oil, etc. Non-limiting examples of fatty acids (FA) are listed in U.S. Pat. No. 5,759,990 at column 4, lines 45-66.
- Mixtures of fatty acids, and mixtures of FAs that are derived from different fatty acids can be used, and are preferred. Nonlimiting examples of FA's that can be blended, to form FA's of this invention are as follows:

<u>Fatty Acyl Group</u>	<u>FA¹</u>	<u>FA²</u>	<u>FA³</u>
C ₁₄	0	0	1
C ₁₆	3	11	25
C ₁₈	3	4	20
C14:1	0	0	0
C16:1	1	1	0
C18:1	79	27	45
C18:2	13	50	6
C18:3	1	7	0
Unknowns	0	0	3
<i>Total</i>	100	100	100
IV	99	125-138	56

cis/trans (C18:1)	5 - 6	Not Available	7
TPU	14	57	6

FA¹ is a partially hydrogenated fatty acid prepared from canola oil, FA² is a fatty acid prepared from soy bean oil, and FA³ is a slightly hydrogenated tallow fatty acid.

5

Preferred quaternary ammonium actives contain an effective amount of molecules containing two ester linked hydrophobic groups [R¹C(CO)O-], said actives being referred to herein as "DEQA's", are those that are prepared as a single DEQA from blends of all the different fatty acids that are represented (total fatty acid blend), rather than from blends of mixtures of separate finished DEQA's that are prepared from different portions of the total fatty acid blend.

It is preferred that at least a majority of the fatty acyl groups are unsaturated, e.g., from about 50% to 100%, preferably from about 55% to about 99%, more preferably from about 60% to about 98%, and that the total level of active containing polyunsaturated fatty acyl groups (TPU) be preferably from 0% to about 30%. The cis/trans ratio for the unsaturated fatty acyl groups is usually important, with the cis/trans ratio being from about 1:1 to about 50:1, the minimum being about 1:1, preferably at least about 3:1, and more preferably from about 4:1 to about 20:1. (As used herein, the "percent of quaternary ammonium active" containing a given R¹ group is the same as the percentage of that same R¹ group is to the total R¹ groups used to form all of the quaternary ammonium actives.)

The unsaturated, including the preferred polyunsaturated, fatty acyl and/or alkylene groups, discussed hereinbefore and hereinafter, surprisingly provide good dewrinkling and effective softening, but also provide better rewetting characteristics, good antistatic characteristics, and especially, superior recovery after freezing and thawing.

30

These unsaturated actives are also easier to process at lower temperatures. These highly unsaturated materials (total level of active containing polyunsaturated fatty acyl groups (TPU) being typically from about 3% to about 30%, with only the low amount of solvent that normally is associated with such

- materials, i.e., from about 5% to about 20%, preferably from about 8% to about 25%, more preferably from about 10 to about 20%, weight of the total quaternary ammonium/solvent mixture are easier to formulate into the product and remain in stable solutions, emulsions, and or dispersions longer. This ability to process the
- 5 actives at low temperatures is especially important for the polyunsaturated groups, since it minimizes degradation. Additional protection against degradation can be provided when the compounds and wrinkle compositions contain effective antioxidants, chelants, and/or reducing agents, as disclosed hereinafter.
- 10 It will be understood that substituents R and R¹ can optionally be substituted with various groups such as alkoxy or hydroxyl groups, and can be straight, or branched so long as the R¹ groups maintain their basically hydrophobic character.
- 15 A preferred long chain DEQA is the DEQA prepared from sources containing high levels of polyunsaturation, i.e., N,N-di(acyl-oxyethyl)-N,N-methylhydroxyethylammonium methyl sulfate, where the acyl is derived from fatty acids containing sufficient polyunsaturation, e.g., mixtures of tallow fatty acids and soybean fatty acids. Another preferred long chain DEQA is the dioleyl
- 20 (nominally) DEQA, i.e., DEQA in which N,N-di(oleoyl-oxyethyl)-N,N-methylhydroxyethylammonium methyl sulfate is the major ingredient. Preferred sources of fatty acids for such DEQAs are vegetable oils, and/or partially hydrogenated vegetable oils, with high contents of unsaturated, e.g., oleoyl groups.
- 25 As used herein, when the DEQA diester (m=2) is specified, it can include the monoester (m=1) and/or triester (m=3) that are present. Preferably, at least about 30% of the DEQA is in the diester form, and from 0% to about 30% can be DEQA monoester, e.g., there are three R groups and one R¹ group.
- 30 The above compounds can be prepared using standard reaction chemistry. In one synthesis of a di-ester variation of DTDMAC, triethanolamine of the formula N(CH₂CH₂OH)₃ is esterified, preferably at two hydroxyl groups, with an acid chloride of the formula R¹C(O)Cl, to form an amine which can be made cationic
- 35 by acidification (one R is H) to be one type of active, or then quaternized with an alkyl halide, RX, to yield the desired reaction product (wherein R and R¹ are as

defined hereinbefore). However, it will be appreciated by those skilled in the chemical arts that this reaction sequence allows a broad selection of agents to be prepared.

- 5 In preferred DEQA (1) and DEQA (2) quaternary ammonium actives, each R¹ is a hydrocarbyl, or substituted hydrocarbyl, group, preferably, alkyl, monounsaturated alkenyl, and polyunsaturated alkenyl groups, with the quaternary ammonium active containing polyunsaturated alkenyl groups being preferably at least about 3%, more preferably at least about 5%, more preferably
10 at least about 10%, and even more preferably at least about 15%, by weight of the total quaternary ammonium active present; the actives preferably containing mixtures of R¹ groups, especially within the individual molecules.

- The DEQAs herein can also contain a low level of fatty acid, which can be from
15 unreacted starting material used to form the DEQA and/or as a by-product of any partial degradation (hydrolysis) of the quaternary ammonium active in the finished composition. It is preferred that the level of free fatty acid be low, preferably below about 15%, more preferably below about 10%, and even more preferably below about 5%, by weight of the quaternary ammonium active.

- 20 The quaternary ammonium actives herein are preferably prepared by a process wherein a chelant, preferably a diethylenetriaminepentaacetate (DTPA) and/or an ethylene diamine-N,N'-disuccinate (EDDS) is added to the process. Another acceptable chelant is tetrakis-(2-hydroxypropyl) ethylenediamine (TPED). Also,
25 preferably, antioxidants are added to the fatty acid immediately after distillation and/or fractionation and/or during the esterification reactions and/or post-added to the finished quaternary ammonium active. The resulting active has reduced discoloration and malodor associated therewith.

- 30 The total amount of added chelating agent is preferably within the range of from about 10 ppm to about 5,000 ppm, more preferably within the range of from about 100 ppm to about 2500 ppm by weight of the formed quaternary ammonium active. The source of triglyceride is preferably selected from the group consisting of animal fats, vegetable oils, partially hydrogenated vegetable oils, and mixtures
35 thereof. More preferably, the vegetable oil or partially hydrogenated vegetable oil is selected from the group consisting of canola oil, partially hydrogenated canola

oil, safflower oil, partially hydrogenated safflower oil, peanut oil, partially hydrogenated peanut oil, sunflower oil, partially hydrogenated sunflower oil, corn oil, partially hydrogenated corn oil, soybean oil, partially hydrogenated soybean oil, tall oil, partially hydrogenated tall oil, rice bran oil, partially hydrogenated rice bran oil, and mixtures thereof. Most preferably, the source of triglyceride is
5 canola oil, partially hydrogenated canola oil, and mixtures thereof. The process can also include the step of adding from about 0.01% to about 2% by weight of the composition of an antioxidant compound to any or all of the steps in the processing of the triglyceride up to, and including, the formation of the quaternary
10 ammonium active.

The above processes produce a quaternary ammonium active with reduced coloration and malodor.

15 Additional actives that can be used herein are disclosed, at least generically for the basic structures, in U.S. Pat. Nos. 3,861,870, Edwards and Diehl; 4,308,151, Cambre; 3,886,075, Bernardino; 4,233,164, Davis; 4,401,578, Verbruggen; 3,974,076, Wiersema and Rieke; and 4,237,016, Rudkin, Clint, and Young, all of said patents being incorporated herein by reference. The additional actives
20 herein are preferably those that are highly unsaturated versions of the traditional quaternary ammonium actives, i.e., di-long chain alkyl nitrogen derivatives, normally cationic materials, such as dioleyldimethylammonium chloride and imidazolium compounds as described hereinafter. Examples of more biodegradable fabric quaternary ammonium actives can be found in U.S. Pat.
25 Nos. 3,408,361, Mannheimer, issued Oct. 29, 1968; 4,709,045, Kubo et al., issued Nov. 24, 1987; 4,233,451, Pracht et al., issued Nov. 11, 1980; 4,127,489, Pracht et al., issued Nov. 28, 1979; 3,689,424, Berg et al., issued Sept. 5, 1972; 4,128,485, Baumann et al., issued Dec. 5, 1978; 4,161,604, Elster et al., issued July 17, 1979; 4,189,593, Wechsler et al., issued Feb. 19, 1980; and 4,339,391,
30 Hoffman et al., issued July 13, 1982, said patents being incorporated herein by reference.

It will be understood that suitable wrinkle compositions can include combinations of quaternary ammonium actives disclosed herein.

- In the cationic nitrogenous salts herein, the anion A^- , which is any quaternary ammonium compatible anion, provides electrical neutrality. Most often, the anion used to provide electrical neutrality in these salts is from a strong acid, especially a halide, such as chloride, bromide, or iodide. However, other anions can be used, such as methylsulfate, ethylsulfate, acetate, formate, sulfate, carbonate, and the like. Chloride and methylsulfate are preferred herein as anion A. The anion can also, but less preferably, carry a double charge in which case A^- represents half a group.
- 10 In addition to lubricating fibers, quaternary ammonium compound disclosed herein can offer additional benefits including improved softening and handfeel as well as protection and/or restoration of fibers and fabric appearance.

(2) Liquid carrier

- 15 Another optional, but preferred, ingredient is a liquid carrier. The liquid carrier employed in the instant compositions is preferably at least primarily water due to its low cost, relative availability, safety, and environmental compatibility. The level of water in the liquid carrier is preferably at least about 50%, most preferably at least about 60%, by weight of the carrier. Mixtures of water and low molecular weight, e.g., <about 200, organic solvent, e.g., lower alcohols such as ethanol, propanol, isopropanol or butanol are useful as the carrier liquid. Low molecular weight alcohols include monohydric, dihydric (glycol, etc.) trihydric (glycerol, etc.), and higher polyhydric (polyols) alcohols.

25 (3) Dispersibility Aids

- Relatively concentrated compositions containing both saturated and unsaturated diester quaternary ammonium compounds can be prepared that are stable without the addition of concentration aids. However, the compositions of the present invention may require organic and/or inorganic concentration aids to go to even higher concentrations and/or to meet higher stability standards depending on the other ingredients. These concentration aids which typically can be viscosity modifiers may be needed, or preferred, for ensuring stability under extreme conditions when particular softener active levels are used. The surfactant concentration aids are typically selected from the group consisting of
- 30 (1) single long chain alkyl cationic surfactants; (2) nonionic surfactants; (3) amine oxides; (4) fatty acids; and (5) mixtures thereof. These aids are described in WO
- 35

94/20597, specifically on page 14, line 12 to page 20, line 12, which is herein incorporated by reference.

When said dispersibility aids are present, the total level is from 0.1% to 20%, preferably from 0.2% to 10%, more preferably from 0.5% to 5%, and even more preferably from 0.5% to 2% by weight of the composition. These materials can either be added as part of the active softener raw material, (I), e.g., the mono-long chain alkyl cationic surfactant and/or the fatty acid which are reactants used to form the biodegradable fabric softener active as discussed hereinbefore, or added as a separate component. The total level of dispersibility aid includes any amount that may be present as part of component (I).

Inorganic viscosity/dispersibility control agents which can also act like or augment the effect of the surfactant concentration aids, include water-soluble, ionizable salts which can also optionally be incorporated into the compositions of the present invention. A wide variety of ionizable salts can be used. Examples of suitable salts are the halides of the Group IA and IIA metals of the Periodic Table of the Elements, e.g., calcium chloride, magnesium chloride, sodium chloride, potassium bromide, and lithium chloride. The ionizable salts are particularly useful during the process of mixing the ingredients to make the compositions herein, and later to obtain the desired viscosity. The amount of ionizable salts used depends on the amount of active ingredients used in the compositions and can be adjusted according to the desires of the formulator. Typical levels of salts used to control the composition viscosity are from about 20 to about 20,000 parts per million (ppm), preferably from about 20 to about 11,000 ppm, by weight of the composition.

Alkylene polyammonium salts can be incorporated into the composition to give viscosity control in addition to or in place of the water-soluble, ionizable salts above. In addition, these agents can act as scavengers, forming ion pairs with anionic detergent carried over from the main wash, in the rinse, and on the fabrics, and may improve softness performance. These agents may stabilize the viscosity over a broader range of temperature, especially at low temperatures, compared to the inorganic electrolytes.

Specific examples of alkylene polyammonium salts include L-lysine monohydrochloride and 1,5-diammonium 2-methyl pentane dihydrochloride.

(4)-Stabilizers

Stabilizers can be present in the compositions of the present invention. The term "stabilizer," as used herein, includes antioxidants and reductive agents. These agents are present at a level of from 0% to about 2%, preferably from about 0.01% to about 0.2%, more preferably from about 0.035% to about 0.1% for antioxidants, and more preferably from about 0.01% to about 0.2% for reductive agents. These assure good odor stability under long term storage conditions for the compositions and compounds stored in molten form. The use of antioxidants and reductive agent stabilizers is especially critical for low scent products (low perfume).

Examples of antioxidants that can be added to the compositions of this invention include a mixture of ascorbic acid, ascorbic palmitate, propyl gallate, available from Eastman Chemical Products, Inc., under the trade names Tenox® PG and Tenox S-1; a mixture of BHT (butylated hydroxytoluene), BHA (butylated hydroxyanisole), propyl gallate, and citric acid, available from Eastman Chemical Products, Inc., under the trade name Tenox-6; butylated hydroxytoluene, available from UOP Process Division under the trade name Sustane® BHT; tertiary butylhydroquinone, Eastman Chemical Products, Inc., as Tenox TBHQ; natural tocopherols, Eastman Chemical Products, Inc., as Tenox GT-1/GT-2; and butylated hydroxyanisole, Eastman Chemical Products, Inc., as BHA; long chain esters (C₈-C₂₂) of gallic acid, e.g., dodecyl gallate; Irganox® 1010; Irganox® 1035; Irganox® B 1171; Irganox® 1425; Irganox® 3114; Irganox® 3125; and mixtures thereof; preferably Irganox® 3125, Irganox® 1425, Irganox® 3114, and mixtures thereof; more preferably Irganox® 3125 alone. The chemical names and CAS numbers for some of the above stabilizers are listed in Table II below.

TABLE II

Antioxidant	CAS No.	Chemical Name used in Code of Federal Regulations
Irganox® 1010	6683-19-8	Tetrakis (methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)) methane
Irganox® 1035	41484-35-9	Thiodiethylene bis(3,5-di-tert-butyl-4-hydroxyhydrocinnamate
Irganox® 1098	23128-74-7	N,N'-Hexamethylene bis(3,5-di-tert-butyl-4-hydroxyhydrocinnamamide
Irganox® B 1171	31570-04-4	

	23128-74-7	1:1 Blend of Irganox® 1098 and Irgafos® 168
Irganox® 1425	65140-91-2	Calcium bis(monoethyl(3,5-di-tert-butyl-4-hydroxybenzyl)phosphonate)
Irganox® 3114	65140-91-2	Calcium bis(monoethyl(3,5-di-tert-butyl-4-hydroxybenzyl)phosphonate)
5 Irganox® 3125	34137-09-2	3,5-Di-tert-butyl-4-hydroxy-hydrocinnamic acid triester with 1,3,5-tris(2-hydroxyethyl)-S-triazine-2,4,6-(1H, 3H, 5H)-trione
Irgafos® 168	31570-04-4	Tris(2,4-di-tert-butyl-phenyl)phosphite

10

Examples of reductive agents include sodium borohydride, hypophosphorous acid, Irgafos® 168, and mixtures thereof.

5- PRESERVATIVE

- 15 Optionally, but preferably, antimicrobial preservative can be added to the composition of the present invention. Contamination by certain microorganisms with subsequent microbial growth can result in an unsightly and/or malodorous solution. Because microbial growth in solutions is highly objectionable when it occurs, it is highly preferable to include an antimicrobial preservative, which is
- 20 effective for inhibiting and/or regulating microbial growth in order to increase storage stability of the composition.

- It is preferable to use a broad spectrum preservative, e.g., one that is effective on both bacteria (both gram positive and gram negative) and fungi. A limited
- 25 spectrum preservative, e.g., one that is only effective on a single group of microorganisms, e.g., fungi, can be used in combination with a broad spectrum preservative or other limited spectrum preservatives with complimentary and/or supplementary activity. A mixture of broad spectrum preservatives can also be used. In some cases where a specific group of microbial contaminants is
- 30 problematic (such as Gram negatives), aminocarboxylate chelators, such as those described hereinbefore, can be used alone or as potentiators in conjunction with other preservatives. These chelators which include, e.g., ethylenediaminetetraacetic acid (EDTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepentaacetic acid, and other aminocarboxylate chelators, and
- 35 mixtures thereof, and their salts, and mixtures thereof, can increase preservative effectiveness against Gram-negative bacteria, especially *Pseudomonas* species.

Antimicrobial preservatives useful in the present invention include biocidal compounds, i.e., substances that kill microorganisms, or biostatic compounds, i.e., substances that inhibit and/or regulate the growth of microorganisms. Well known preservatives such as short chain alkyl esters of p-hydroxybenzoic acid, commonly known as parabens; N-(4-chlorophenyl)-N'-(3,4-dichlorophenyl) urea, also known as 3,4,4'-trichlorocarbaniide or triclocarban; 2,4,4'-trichloro-2'-hydroxy diphenyl ether, commonly known as triclosan are useful preservative in the present invention.

Still other preferred preservatives are the water-soluble preservatives, i.e. those that have a solubility in water of at least about 0.3 g per 100 ml of water, i.e., greater than about 0.3% at room temperature, preferably greater than about 0.5% at room temperature.

The preservative in the present invention is included at an effective amount. The term "effective amount" as herein defined means a level sufficient to prevent spoilage, or prevent growth of inadvertently added microorganisms, for a specific period of time. In other words, the preservative is not being used to kill microorganisms on the surface onto which the composition is deposited in order to eliminate odors produced by microorganisms. Instead, it is preferably being used to prevent spoilage of the solution in order to increase the shelf-life of the composition. Preferred levels of preservative are from about 0.0001% to about 0.5%, more preferably from about 0.0002% to about 0.2%, most preferably from about 0.0003% to about 0.1%, by weight of the usage composition.

The preservative can be any organic preservative material which will not cause damage to fabric appearance, e.g., discoloration, coloration, bleaching. Preferred water-soluble preservatives include organic sulfur compounds, halogenated compounds, cyclic organic nitrogen compounds, low molecular weight aldehydes, quaternary ammonium compounds, dehydroacetic acid, phenyl and phenolic compounds, and mixtures thereof. Non-limiting examples of preferred water-soluble preservatives for use in the present invention can be found in U.S. Patent 5,714,137, incorporated hereinbefore by reference, as well as co-pending application PCT/US 98/12154 pages 29 to 36.

Preferred water-soluble preservatives for use in the present invention are organic sulfur compounds. Some non-limiting examples of organic sulfur compounds suitable for use in the present invention are:

5 (a) 3-Isothiazolone Compounds

A preferred preservative is an antimicrobial, organic preservative containing 3-isothiazolone groups. This class of compounds is disclosed in U.S. Pat. No. 4,265,899, Lewis et al., issued May 5, 1981, and incorporated herein by
10 reference. A preferred preservative is a water-soluble mixture of 5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one, more preferably a mixture of about 77% 5-chloro-2-methyl-4-isothiazolin-3-one and about 23% 2-methyl-4-isothiazolin-3-one, a broad spectrum preservative available as a 1.5% aqueous solution under the trade name Kathon® CG by Rohm and Haas
15 Company.

When Kathon® is used as the preservative in the present invention it is present at a level of from about 0.0001% to about 0.01%, preferably from about 0.0002% to about 0.005%, more preferably from about 0.0003% to about 0.003%, most
20 preferably from about 0.0004% to about 0.002%, by weight of the composition.

Other isothiazolins include 1,2-benzisothiazolin-3-one, available under the trade name Proxel® products; and 2-methyl-4,5-trimethylene-4-isothiazolin-3-one, available under the trade name Promexal®. Both Proxel and Promexal are
25 available from Zeneca. They have stability over a wide pH range (i.e., 4-12). Neither contain active halogen and are not formaldehyde releasing preservatives. Both Proxel and Promexal are effective against typical Gram negative and positive bacteria, fungi and yeasts when used at a level from about 0.001% to about 0.5%, preferably from about 0.005% to about 0.05%, and most preferably
30 from about 0.01% to about 0.02% by weight of the usage composition.

(b) Sodium Pyrithione

Another preferred organic sulfur preservative is sodium pyrithione, with water solubility of about 50%. When sodium pyrithione is used as the preservative in
35 the present invention it is typically present at a level of from about 0.0001% to

about 0.01%, preferably from about 0.0002% to about 0.005%, more preferably from about 0.0003% to about 0.003%, by weight of the usage composition.

- 5 Mixtures of the preferred organic sulfur compounds can also be used as the preservative in the present invention.

6- Antimicrobial active

- 10 The composition may suitably use an optional solubilized, water-soluble antimicrobial active, useful in providing protection against organisms that become attached to the treated material. The free, uncomplexed antimicrobial, e.g., antibacterial, active provides an optimum antibacterial performance.

- 15 Sanitization of fabrics can be achieved by the compositions of the present invention containing, antimicrobial materials, e.g., antibacterial halogenated compounds, quaternary compounds, and phenolic compounds.

- 20 Biguanides. Some of the more robust antimicrobial halogenated compounds which can function as disinfectants/sanitizers as well as finish product preservatives (vide infra), and are useful in the compositions of the present invention include 1,1'-hexamethylene bis(5-(p-chlorophenyl)biguanide), commonly known as chlorhexidine, and its salts, e.g., with hydrochloric, acetic and gluconic acids. The digluconate salt is highly water-soluble, about 70% in water, and the diacetate salt has a solubility of about 1.8% in water. When chlorhexidine is used as a sanitizer in the present invention it is typically present
- 25 at a level of from about 0.001% to about 0.4%, preferably from about 0.002% to about 0.3%, and more preferably from about 0.01% to about 0.1%, by weight of the usage composition. In some cases, a level of from about 1% to about 2% may be needed for virucidal activity.

- 30 Other useful biguanide compounds include Cosmocil® CQ®, Vantocil® IB, including poly (hexamethylene biguanide) hydrochloride. Other useful cationic antimicrobial agents include the bis-biguanide alkanes. Usable water soluble salts of the above are chlorides, bromides, sulfates, alkyl sulfonates such as methyl sulfonate and ethyl sulfonate, phenylsulfonates such as p-methylphenyl sulfonates, nitrates, acetates, gluconates, and the like.
- 35

As stated hereinbefore, the bis biguanide of choice is chlorhexidine and its salts, e.g., digluconate, dihydrochloride, diacetate, and mixtures thereof.

Quaternary Compounds. A wide range of quaternary compounds can also be
5 used as antimicrobial actives, in conjunction with the preferred surfactants, for compositions of the present invention that do not contain cyclodextrin. Non-limiting examples of useful quaternary compounds include: (1) benzalkonium chlorides and/or substituted benzalkonium chlorides such as commercially available Barquat® (available from Lonza), Maquat® (available from Mason),
10 Variquat® (available from Witco/Sherex), and Hyamine® (available from Lonza); (2) dialkyl quaternary such as Bardac® products of Lonza, (3) N-(3-chloroallyl) hexaminium chlorides such as Dowicide® and Dowicil® available from Dow; (4) benzethonium chloride such as Hyamine® 1622 from Rohm & Haas; (5) methylbenzethonium chloride represented by Hyamine® 10X supplied by Rohm
15 & Haas, (6) cetylpyridinium chloride such as Cepacol chloride available from of Merrell Labs. Typical concentrations for biocidal effectiveness of these quaternary compounds range from about 0.001% to about 0.8%, preferably from about 0.005% to about 0.3%, more preferably from about 0.01% to 0.2%, by weight of the usage composition. The corresponding concentrations for the
20 concentrated compositions are from about 0.003% to about 2%, preferably from about 0.006% to about 1.2%, and more preferably from about 0.1% to about 0.8% by weight of the concentrated compositions.

Other preservatives which are conventional in the art, such as described in US
25 5,593, 670 incorporated herein by reference, may also be used herein.

7-Perfume

The present invention can contain a perfume. Suitable perfumes are disclosed in
U.S. Pat. 5,500,138, said patent being incorporated herein by reference.

30

As used herein, perfume includes fragrant substance or mixture of substances including natural (i.e., obtained by extraction of flowers, herbs, leaves, roots, barks, wood, blossoms or plants), artificial (i.e., a mixture of different nature oils or oil constituents) and synthetic (i.e., synthetically produced) odoriferous
35 substances. Such materials are often accompanied by auxiliary materials, such as fixatives, extenders, stabilizers and solvents. These auxiliaries are also

included within the meaning of "perfume", as used herein. Typically, perfumes are complex mixtures of a plurality of organic compounds.

Examples of perfume ingredients useful in the perfumes of the present invention

- 5 compositions include, but are not limited to, hexyl cinnamic aldehyde; amyl cinnamic aldehyde; amyl salicylate; hexyl salicylate; terpineol; 3,7-dimethyl-*cis*-2,6-octadien-1-ol; 2,6-dimethyl-2-octanol; 2,6-dimethyl-7-octen-2-ol; 3,7-dimethyl-3-octanol; 3,7-dimethyl-*trans*-2,6-octadien-1-ol; 3,7-dimethyl-6-octen-1-ol; 3,7-dimethyl-1-octanol; 2-methyl-3-(*para*-*tert*-butylphenyl)-propionaldehyde; 4-(4-
10 hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde; tricyclodecenyl propionate; tricyclodecenyl acetate; anisaldehyde; 2-methyl-2-(*para*-isopropylphenyl)-propionaldehyde; ethyl-3-methyl-3-phenyl glycidate; 4-(*para*-hydroxyphenyl)-butan-2-one; 1-(2,6,6-trimethyl-2-cyclohexen-1-yl)-2-buten-1-one; *para*-methoxyacetophenone; *para*-methoxy- α -phenylpropene; methyl-2-*n*-
15 hexyl-3-oxo-cyclopentane carboxylate; undecalactone gamma.

Additional examples of fragrance materials include, but are not limited to, orange

- oil; lemon oil; grapefruit oil; bergamot oil; clove oil; dodecalactone gamma; methyl-2-(2-pentyl-3-oxo-cyclopentyl) acetate; beta-naphthol methylether; methyl-
20 beta-naphthylketone; coumarin; decylaldehyde; benzaldehyde; 4-*tert*-butylcyclohexyl acetate; α,α -dimethylphenethyl acetate; methylphenylcarbonyl acetate; Schiff's base of 4-(4-hydroxy-4-methylpentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate; cyclic ethyleneglycol diester of tridecandioic acid; 3,7-dimethyl-2,6-octadiene-1-nitrile; ionone gamma
25 methyl; ionone alpha; ionone beta; petitgrain; methyl cedrylone; 7-acetyl-1,2,3,4,5,6,7,8-octahydro-1,1,6,7-tetramethyl-naphthalene; ionone methyl; methyl-1,6,10-trimethyl-2,5,9-cyclododecatrien-1-yl ketone; 7-acetyl-1,1,3,4,4,6-hexamethyl tetralin; 4-acetyl-6-*tert*-butyl-1,1-dimethyl indane; benzophenone; 6-acetyl-1,1,2,3,3,5-hexamethyl indane; 5-acetyl-3-isopropyl-1,1,2,6-tetramethyl
30 indane; 1-dodecanal; 7-hydroxy-3,7-dimethyl octanal; 10-undecen-1-al; isohexenyl cyclohexyl carboxaldehyde; formyl tricyclodecan; cyclopentadecanolide; 16-hydroxy-9-hexadecenoic acid lactone; 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-gamma-2-benzopyrane; ambroxane; dodecahydro-
3a,6,6,9a-tetramethylnaphtho-[2,1b]furan; cedrol; 5-(2,2,3-trimethylcyclopent-3-
35 enyl)-3-methylpentan-2-ol; 2-ethyl-4-(2,2,3-trimethyl-3-cyclopenten-1-yl)-2-buten-1-ol; caryophyllene alcohol; cedryl acetate; *para*-*tert*-butylcyclohexyl acetate;

patchouli; olibanum resinoid; labdanum; vetivert; copaiba balsam; fir balsam; and condensation products of: hydroxycitronellal and methyl anthranilate; hydroxycitronellal and indol; phenyl acetaldehyde and indol; 4-(4-hydroxy-4-methyl pentyl)-3-cyclohexene-1-carboxaldehyde and methyl anthranilate.

- 5 More examples of perfume components are geraniol; geranyl acetate; linalool; linalyl acetate; tetrahydrolinalool; citronellol; citronellyl acetate; dihydromyrcenol; dihydromyrcenyl acetate; tetrahydromyrcenol; terpinyl acetate; nopol; nopyl acetate; 2-phenylethanol; 2-phenylethyl acetate; benzyl alcohol; benzyl acetate; benzyl salicylate; benzyl benzoate; styrallyl acetate; dimethylbenzylcarbinol;
- 10 trichloromethylphenylcarbinyl methylphenylcarbinyl acetate; isononyl acetate; vetiveryl acetate; vetiverol; 2-methyl-3-(p-tert-butylphenyl)-propanal; 2-methyl-3-(p-isopropylphenyl)-propanal; 3-(p-tert-butylphenyl)-propanal; 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde; 4-acetoxy-3-pentyltetrahydropyran; methyl dihydrojasmonate; 2-n-heptylcyclopentanone; 3-methyl-2-pentyl-
- 15 cyclopentanone; n-decanal; n-dodecanal; 9-decenol-1; phenoxyethyl isobutyrate; phenylacetaldehyde dimethylacetal; phenylacetaldehyde diethylacetal; geranonitrile; citronellonitrile; cedryl acetal; 3-isocamphylcyclohexanol; cedryl methylether; isolongifolanone; aubepine nitrile; aubepine; heliotropine; eugenol; vanillin; diphenyl oxide; hydroxycitronellal ionones; methyl ionones; isomethyl
- 20 ionomes; irones; cis-3-hexenol and esters thereof; indane musk fragrances; tetralin musk fragrances; isochroman musk fragrances; macrocyclic ketones; macrolactone musk fragrances; ethylene brassylate.

- The perfumes useful in the present invention compositions are substantially free
- 25 of halogenated materials and nitromusks.

- Suitable solvents, diluents or carriers for perfumes ingredients mentioned above are for examples, ethanol, isopropanol, diethylene glycol, monoethyl ether, dipropylene glycol, diethyl phthalate, triethyl citrate, etc. The amount of such
- 30 solvents, diluents or carriers incorporated in the perfumes is preferably kept to the minimum needed to provide a homogeneous perfume solution.

- Perfume can be present at a level of from 0% to 10%, preferably from 0.1% to 5%, and more preferably from 0.2% to 3%, by weight of the finished composition.
- 35 Fabric softener compositions of the present invention provide improved fabric perfume deposition.

Perfume ingredients may also be suitably added as releasable fragrances, for example, as pro-perfumes or pro-fragrances as described in U.S. 5,652,205 Hartman *et al.*, issued July 29, 1997, WO95/04809, WO96/02625, PCT
5 US97/14610 filed 19 August 1997 and claiming priority of 19 August 1996, EP-A-0,752,465, co-pending application EP 98870227.0, EP 98870226.2, EP 99870026.4, and EP 99870025.6; all incorporated herein by reference.

8- Soil Release Agent

- 10 Soil Release agents are desirably used in compositions of the instant invention. Any polymeric soil release agent known to those skilled in the art can optionally be employed in the compositions of this invention. Polymeric soil release agents are characterized by having both hydrophilic segments, to hydrophilize the surface of hydrophobic fibers, such as polyester and nylon, and hydrophobic
15 segments, to deposit upon hydrophobic fibers and remain adhered thereto through completion of washing and rinsing cycles and, thus, serve as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to treatment with the soil release agent to be more easily cleaned in later washing procedures.

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If utilized, soil release agents will generally comprise from about 0.01% to about 10.0%, by weight, of the detergent compositions herein, typically from about 0.1% to about 5%, preferably from about 0.2% to about 3.0%.

- 25 The following, all included herein by reference, describe soil release polymers suitable for use in the present invention. U.S. 3,959,230 Hays, issued May 25, 1976; U.S. 3,893,929 Basadur, issued July 8, 1975; U.S. 4,000,093, Nicol, *et al.*, issued December 28, 1976; U.S. Patent 4,702,857 Gosselink, issued October 27, 1987; U.S. 4,968,451, Scheibel *et al.*, issued November 6; U.S. 4,702,857,
30 Gosselink, issued October 27, 1987; U.S. 4,711,730, Gosselink *et al.*, issued December 8, 1987; U.S. 4,721,580, Gosselink, issued January 26, 1988; U.S. 4,877,896, Maldonado *et al.*, issued October 31, 1989; U.S. 4,956,447, Gosselink *et al.*, issued September 11, 1990; U.S. 5,415,807 Gosselink *et al.*, issued May 16, 1995; European Patent Application 0 219 048, published April 22, 1987 by
35 Kud, *et al.*

Further suitable soil release agents are described in U.S. 4,201,824, Violland *et al.*; U.S. 4,240,918 Lagasse *et al.*; U.S. 4,525,524 Tung *et al.*; U.S. 4,579,681, Ruppert *et al.*; U.S. 4,240,918; U.S. 4,787,989; U.S. 4,525,524; EP 279,134 A, 1988, to Rhone-Poulenc Chemie; EP 457,205 A to BASF (1991); and DE 2,335,044 to Unilever N. V., 1974 all incorporated herein by reference.

Commercially available soil release agents include the METOLOSE SM100, METOLOSE SM200 manufactured by Shin-etsu Kagaku Kogyo K.K., SOKALAN type of material, e.g., SOKALAN HP-22, available from BASF (Germany), ZELCON 5126 (from Dupont) and MILEASE T (from ICI).

9-pH

An optional requirement of the compositions according to the present invention is that the pH is greater than 3, preferably between 5 and 7, more preferably in the range of 5.5 to 6.5.. This range is preferred for fabric safety. When a lubricant of the diester quaternary ammonium type is used, it is most preferred to have the conventional pH range, as measured in the neat compositions at 20 °C, of from 2.0 to 5, preferably in the range of 2.5 to 4.5, preferably about 2.5 to about 3.5. The pH of these compositions herein can be regulated by the addition of a Bronsted acid.

10- Other Optional Ingredients

The present invention can include optional components conventionally used in textile treatment compositions, for example, colorants, preservatives, bactericides, optical brighteners, opacifiers, anti-shrinkage agents, germicides, fungicides, anti-oxidants, dye fixing agent as described in EP 931133, enzymes, chelating agents, cyclodextrin as described in WO 98/56888, metallic salts to absorb amine and sulfur-containing compounds and selected from the group consisting of copper salts, zinc salts, and mixtures thereof, water-soluble polyionic polymers, e.g., water-soluble cationic polymer like polyamines, other antistatic agent, insect and/or moth repelling agents, colorants and dyes, anti-clogging agent, and the like; typical disclosure of which can be found in WO 98/56888. Still another suitable optional are void fillers like isomalto oligosaccharide mixtures, and ingredients which provide shield protection against stain like hydroxypropylcellulose as well as other cellulosic polymer like carboxymethylcellulose. The compositions are preferably free of any material that

would soil or stain fabric, and are also substantially free of starch. Typically, there should be less than about 0.5%, by weight of the composition, preferably less than about 0.3%, more preferably less than about 0.1%, by weight of the composition, of starch and/or modified starch.

5

Form of the composition

The composition of the invention may take a variety of physical form including liquid, liquid-gel, paste-like, foam in either aqueous or non-aqueous form, powder like granular and tablet forms. A preferred form of the composition is in a liquid form.

10

Non-limiting forms of articles of manufactures for the dispensing of the compositions of the invention includes aerosol, spray, foam, iron as well as refill and/or cartridge for such articles.

15

When in a liquid form, the composition is preferably dispensed by a dispensing means such as a spray dispenser, aerosol dispenser, or refill thereof. Still another preferred dispensing means is by incorporation of the composition of the invention in the ironing tank per se, or via a cartridge preferably adapted for the iron and/or the spray dispenser.

20

Spray Dispenser

The present invention also relates to such compositions incorporated into a spray dispenser to create an article of manufacture that can facilitate treatment of fabric articles and/or surfaces with the compositions according to the invention at a level that is effective. The spray dispenser comprises manually activated and non-manual powered (operated) spray means and a container containing the treating composition. Typical disclosure of such spray dispenser can be found in WO 96/04940 page 19 line 21 to page 22 line 27. Preferably, the spray dispenser is selected from spray dispenser comprising battery operated pump, spray dispenser comprising a trigger spray device, spray dispenser comprising a pressurized aerosol spray dispenser.

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Method of use

There is provided a method of treating fabrics, in particular to provide durable press on fabric, i.e. for providing wrinkle resistant fabrics, which comprises the

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steps of contacting the fabrics with a composition or a resin of the invention, as defined herein before, and subsequently curing the composition, preferably using a domestic process.

- 5 Surprisingly, it has been found that this method also provides additional benefits like a reduction of the time and/or effort involved to iron fabrics, crease resistance to fabrics, post wash wrinkle resistance, in-wear wrinkle resistance, and a reduction of the fabric aging upon multiple application.
- 10 By "contacting", it is meant any steps that is suitable for providing a contact of the composition with the fabric. This can include by soaking, washing, rinsing, and/or spraying as well as by means of a dryer sheet onto which is adsorbed the composition. Preferably, the contacting occurs after the laundering and optional drying of the fabrics, e.g. by spraying. Accordingly, in this instance, the
- 15 composition of the present invention is used as an ironing aid. Still another preferred process is where the contacting occurs after the laundering and optional drying of the fabrics, e.g. by spraying, more preferably by spraying from the iron spray dispenser and/or via the vaporisation holes from the iron sole. An effective amount of the composition can be sprayed onto fabric, wherein said
- 20 fabric should not be sprayed to saturation. The fabric can be cured by ironing at the normal temperature at which it should be ironed. Still another preferred way of treating the fabrics is when the fabric can be sprayed with an effective amount of the composition, allowed to dry and then ironed, or sprayed and ironed immediately.
- 25 Domestic curing of the fabric can also be caused by the heat used to dry the fabric, e.g. by tumble drying. Ironing is also particularly advantageous for curing the fabric. Without to be bound by theory, it is believed that the shorter time or the low temperatures used to domestically cure the cross-linking components mean
- 30 that the fabric is made resistant to wrinkles without changing its tactile, or drape properties.

- Still another advantage of the present invention is that when polyquaternary amine resins are used, such as in particular with Kymene compounds, the
- 35 domestic curing can occur at room temperature, i.e. from 15 to 30°C.

Still a further advantage of the above mentioned epichlorhydrin adducts is their usability in industrial treatment. Accordingly, there is also provided a method for treating fabric which comprises the steps of contacting the fabrics with a composition of the invention, and thereafter curing the fabrics. In this preferred method, the curing is that which is conventionally known in industrial process like padding.

In a still further aspect of the invention, the composition can be sprayed onto fabrics by an in-home de-wrinkling chamber containing the fabric to be dewrinkled, thereby providing ease of operation. Conventional personal as well as industrial de-wrinkling apparatuses are suitable for use herein. Traditionally, these apparatuses act by a steaming process which effects a relaxation of the fibers. Examples of home dewrinkling chambers include shower stalls. The spraying of the composition or compounds onto the fabrics can then occur within the chamber of the apparatus or before placing the fabrics into the chamber. As for the manual method of spraying, the spraying means should preferably be capable of providing droplets with a weight average diameter of from about 8 to about 100 μm , preferably from about 10 to about 50 μm . Preferably, the loading of moisture on fabrics made of natural and synthetic fibers is from about 5 to about 25%, more preferably from about 5 to about 10% by weight of the dried fabric. Other conventional steps that can be carried out in the dewrinkling apparatus can be applied such as heating which will provide the curing step and drying. Preferably, for optimum dewrinkling benefit, the temperature profile inside the chamber ranges from about 40°C to about 80°C, more preferably from about 50°C to about 70°C. The preferred length of the drying cycle is from about 15 to about 60 minutes, more preferably from about 20 to about 45 minutes.

The steaming step in the dewrinkling apparatus can also be eliminated if the composition is maintained at a temperature range from about 22°C (about 72°F) to about 76°C (170°F) before spraying.

The present invention encompasses the method of spraying a mist of an effective amount of solution of the invention composition onto fabric and/or fabric articles. Preferably, said fabric and/or fabric articles include, but are not limited to, clothes, curtains, drapes, upholstered furniture, carpeting, bed linens, bath linens, tablecloths, sleeping bags, tents, car interiors, etc.

The compositions herein are especially useful, when used to treat garments for extending the time before another wash cycle is needed. Such garments include uniforms and other garments which are normally treated in an industrial process, which can be dewrinkled and the time between treatments extended.

Also provided herein is an article of manufacture comprising a container and the composition of the invention in association with a set of instructions to use the composition in an amount effective to provide a solution to problems involving and/or provision of a benefit related to those selected from reducing wrinkles; improving the natural drape of fabrics, imparting a crisp finish to fabrics, reducing the time and/or effort involved to iron fabrics, imparting crease resistance to fabrics, imparting post wash wrinkle resistance to fabrics, imparting in-wear resistance to fabrics, imparting a reduction of the fabric aging upon multiple application. It is important that the consumer be aware of these additional benefits, since otherwise the consumer would not know that the composition would solve these problems and/or provide these benefits.

As used herein, the phrase "in association with" means the set of instructions are either directly printed on the container itself or presented in a separate manner including, but not limited to, a brochure, print advertisement, electronic advertisement, and/or verbal communication, so as to communicate the set of instructions to a consumer of the article of manufacture. The set of instructions preferably comprises the instruction to apply an effective amount of the composition, preferably by spraying, to provide the indicated benefit, e.g. wrinkles reduction; improving the natural drape of fabrics, imparting a crisp finish to fabrics, reducing the time and/or effort involved to iron fabrics, imparting crease resistance to fabrics, imparting post wash wrinkle resistance to fabrics, imparting in-wear wrinkle resistance to fabrics, and/or imparting a reduction of the fabric aging upon multiple application.

The invention is illustrated in the following non limiting examples, in which all percentages are on a weight basis unless otherwise stated.

In the examples, the abbreviated component identifications have the following meanings:

- Resin #1 Polyamide/polyamine/epichlorohydrin resin commercially available under the tradename Kymene 557H from Hercules Inc.
- 5 Resin #2 Polyamide/polyamine/epichlorohydrin resin commercially available under the tradename Kymene ULX-2 from Hercules Inc.
- Resin #3 Polyamide/polyamine/epichlorohydrin resin commercially available under the tradename Luresin KNU from BASF.
- 10 Luviskol K30 Polyvinylpyrrolidone (MW about 40,000 Dalton) available from BASF.
- DC 949 Amino-functional silicone emulsion available from Dow Corning
- Silwet L7200 Polyalkylene oxide grafted polydimethylsiloxane (Ratio EO/PO : 75/25; MW 19,000) available from Witco.
- 15 Silwet L7600 Polyalkylene oxide grafted polydimethylsiloxane (All EO; MW 4,000) available from Witco.
- DEG Diethyleneglycol

Example

The following are compositions according to the present invention :

20

	A	B	C	D	E
Resin #1	5%	4%	2.75%	-	-
Resin # 2	-	-	-	3%	-
Resin #3	-	-	-	-	5%
Luviskol K30	1%	-	2%	0.75%	0.75%
DC 949	-	2%	1.5%	0.5%	1.5%
Silwet L7200	2%	3%	1%	1.75%	1%
Silwet L7600	0.5%	1%	0.75%	0.5%	0.25%
DEG	0.25%	0.55%	0.25%	0.35%	0.55%
Perfume	0.05%	0.05%	0.05%	0.05%	0.05%
Water and Minors, e.g. preservative	Balance	Balance	Balance	Balance	Balance

What is claimed is:

1-A wrinkle reducing composition comprising:

- a)-a cross-linking resin having the property of being cationic; and
- b)-a component having the property of being co-cross linkable with the resin and/or a component comprising at least one unit which provides a dye transfer inhibiting benefit;

with the proviso that when the cross-linking resin is a polyquaternary amine resins of the polyamide/polyamine/epichlorhydrin type present in an amount of 15% by weight, the amino functional polymer is not a polyethylene imine with 7 ethoxylations present in an amount of 5% by weight.

2-A composition according to Claim 1, wherein the cross-linking resin having the property of being cationic is selected from epichlorohydrin adducts of polyamine resins, polyethyleneimine resins, cationic starch, polydiallyldimethylammonium chloride, and mixtures thereof, amine-aldehyde resins, amide-aldehyde resins, and mixtures thereof.

3-The composition of Claim 1, wherein said cross-linking resin has a molecular weight between 200 and 1,000,000, preferably between 500 and 100,000.

4-A composition according to any one of Claims 1-3, wherein the cross-linking resin having the property of being cationic is present in an amount of from 0.01% to 60% by weight.

5- A composition according to any one of Claims 1-4, wherein said cross-linking resin is an aldehyde containing cross-linking resin, and wherein said composition further comprises a catalyst, preferably present in an amount of from 10% to 50%, by weight of the cross-linking components or derivative thereof.

6-A composition according to any one of Claims 1-5, wherein the component having the property of being co-cross linkable with the resin is selected from polyamine polymers, amino-functional silicones, alkyl amines, and mixtures thereof.

7-A composition according to any one of Claims 1-6, wherein the component having the property of being co-cross linkable with the resin and/or the component comprising at least one unit which provides a dye transfer inhibiting benefit is present in an amount of from 0.01 to 20% by weight of the composition.

8-A composition according to any one of Claims 1-7, wherein the composition further comprises a lubricant, preferably selected from silicones, synthetic solid particles, quaternary ammonium compounds, and mixtures thereof.

9-A composition according to any one of Claims 1-8, wherein the composition is a liquid composition, preferably a liquid aqueous composition.

10-An article of manufacture comprising a container and a composition according to any one of Claims 1-9.

11-The article of manufacture of Claim 10, wherein the article is selected from an aerosol, a spray dispenser, a refill, a cartridge, an iron, and a foam dispenser.

12-The article of manufacture of Claim 11 wherein said article is a spray dispenser selected from spray dispenser comprising battery operated pump, spray dispenser comprising a trigger spray device, spray dispenser comprising a pressurized aerosol spray dispenser, spray dispenser comprising a non-manually operated spray dispenser.

13-A method for treating the fabrics which comprises the steps of contacting the fabric with a composition according to any one of Claims 1-9 or a resin as defined in any one of Claims 1-5 and subsequently cure the fabric.

14-A method according to Claim 13, wherein said method provides a reduction of the time and/or effort involved to iron fabrics.

15-A method according to either one of Claim 13 or 14, wherein said method provides crease resistance to fabrics

16-A method according to any one of Claims 13-15, wherein said method provides post wash wrinkle resistance.

17-A method according to any one of Claims 13-16, wherein said method provides in-wear wrinkle resistance.

18-A method according to any one of Claims 13-17, wherein said method provides a reduction of the fabric aging upon multiple application.

19-A method according to any one of Claims 13-18, wherein said method is performed in an in-home dewrinkling apparatus.

20-An article of manufacture comprising a container and the composition of any one of Claims 1-9 in association with instructions to use an effective amount of said composition on fabric to provide at least one benefit selected from the group consisting of: reducing wrinkles; improving the natural drape of fabrics, imparting a crisp finish to fabrics, reducing the time and/or effort involved to iron fabrics, imparting crease resistance to fabrics, imparting post wash wrinkle resistance to fabrics, imparting in-wear wrinkle resistance to fabrics, imparting a reduction of the fabric aging upon multiple application.

21-Use of a composition as defined in Claims 1-9, or cartridge as defined in Claim 11, in an iron for treating fabrics.

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International Application No.
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A. CLASSIFICATION OF SUBJECT MATTER

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	EP 0 978 556 A (PROCTER & GAMBLE) 9 February 2000 (2000-02-09) cited in the application page 3, line 46 -page 5, line 2 page 15, line 43 -page 16, line 35; examples	1-9, 13-19, 21
X	GB 2 185 499 A (BIP CHEMICALS LTD) 22 July 1987 (1987-07-22) cited in the application page 1, line 5 - line 55; claims	1-4, 13
X	US 5 342 875 A (NODA ISAO) 30 August 1994 (1994-08-30) column 3, line 60 -column 7, line 45	1, 2
	--- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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A document defining the general state of the art which is not considered to be of particular relevance

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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 4 007 005 A (PATEL KANU I) 8 February 1977 (1977-02-08) column 2, line 1 -column 4, line 9; claims -----	1-6,9-12
A	WO 95 23840 A (PROCTER & GAMBLE) 8 September 1995 (1995-09-08) the whole document -----	1

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(54) Title: FABRIC CARE COMPOSITION

(57) Abstract: A fabric care composition comprises one or more textile compatible carriers and an amphoteric polymer which is capable of self cross-linking and/or of reacting with cellulose and which preferably comprises two or more isocyanate end groups. The compositions may be used to treat fabric as part of a laundering process and improve the surface colour definition of the fabric following multiple washings and/or impart pill and/or fuzz resistance to fabric during laundering.

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FABRIC CARE COMPOSITION5 Technical Field

This invention relates to fabric care compositions and to methods of treating fabric using the compositions.

10

Background and Prior Art

The laundry process generally has several benefits for fabric, the most common being to remove dirt and stains from
15 the fabric during the wash cycle and to soften the fabric during the rinse cycle.

However, there are numerous disadvantages associated with repeated use of conventional laundry treatment compositions
20 and/or the actual laundry process; one of these being a fairly harsh treatment of fabric in the laundry process.

Fabrics can be damaged in several ways as a result of repeated laundering and/or wear. Fabric pilling and loss of
25 fabric surface appearance e.g. fuzzing, shrinkage (or expansion), loss of colour from the fabric or running of colour on the fabric (usually termed dye transfer) are some of the common problems associated with repeated laundering. These problems may occur merely from repeated hand washing
30 as well as the more vigorous machine washing process. Furthermore, problems relating to damage of fabric over time

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through normal use, such as loss of shape and increased likelihood of wrinkling are also significant.

The present invention is directed towards alleviating one or
5 more of these problems.

The principal advantage of the present invention relates to improving the surface colour definition of a fabric after multiple washing and/or to imparting pill and/or fuzz
10 resistance to fabric during laundering. The invention can have further advantages in the treatment of fabric. For example, other aspects of the overall appearance of the fabric can be improved, such as a reduction in the tendency of the fabric to become creased and/or wrinkled.

15 Laundry detergent compositions containing polyamide-polyamine fabric treatment agents are described in WO 98/29530. The compositions are claimed to impart improved overall appearance to fabrics laundered using the detergent
20 compositions, in terms of surface appearance properties such as pill/fuzz reduction and anti-fading. Laundry compositions containing polyamide-polyamine treatment agents of similar types are taught in WO 97/42287.

25 Laundry compositions containing polyamide-polyamine fabric treatment agents can exhibit increased dye pick-up (i.e., increased dye transfer) and poor stain removal properties compared to other conventional laundry compositions.

30 Certain amphoteric polyurethane polymers are known to be useful as lubricating agents in the industrial treatment of

- 3 -

fabric. An example of such a polymer composition is the product sold under the trade mark Arristan PMD by CHT, Germany. Methods for preparing amphoteric polymers of this type are known and are described in, for example,

5 US 3997490.

It is well known that woollen goods are prone to shrinkage and several industrial treatments are known which can reduce the tendency of woollen goods to shrink. These processes are
10 often intended to be applied to whole cloth rather than to finished garments. For various reasons many of these processes are not suitable for, or intended for, home use, being restricted in their application to one-off treatment of the goods or fabric.

15

GB 1547958 (IWS Nominee Company) explains how wool can be made shrink resistant by a chemical oxidative treatment such as chlorination. Such chemical processing reduces washability, so IWS proposes treatment of keratinaceous

20

fibres with amphoteric cross-linking polymers. GB 159272 (IWS Nominee Company) further describes suitable polymers. Each of the processes which are described in these patents is essentially a one-off industrial process, where the polymer needs to be exhausted from solution onto the woollen
25 substrate and such exhaustion either requires the use of exhaustion agents or acidic pH. Such methods of exhausting the treatment agent onto the fabric are not suitable for domestic washing processes and in general the process is not suitable for repeat usage on finished goods.

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Definition of the Invention

The present invention is based on the surprising finding that certain amphoteric polymers can impart improved surface appearance to cellulosic fabrics. The polymers can have the further advantage of reduced adverse side-effects, in terms of increased dye transfer and poor stain removal, for example, compared to certain compositions containing polyamide-polyamine fabric treatment agents. Conveniently, the polymers can be applied repeatedly in a normal domestic laundry operation without the need for exhaustion agents or acidic pH's.

According to the present invention, there is provided a fabric care composition comprising one or more textile compatible and substantive carriers and an amphoteric polymer which is capable of self cross-linking and/or of reacting with cellulose.

The invention also provides a method of treating fabric, as part of a laundering process, which comprises applying to the fabric an amphoteric polymer which is capable of self cross-linking and/or of reacting with cellulose, in a textile compatible and substantive carrier.

Further provided by the invention is the use of an amphoteric polymer which is capable of self cross-linking and/or of reacting with cellulose to improve the surface colour definition of a fabric after multiple washing.

- 5 -

In another aspect, the invention provides the use of an amphoteric polymer, which is capable of self cross-linking and/or of reacting with cellulose to impart pill and/or fuzz resistance to fabric during laundering.

5

In yet another aspect, the invention provides the use of an amphoteric polymer, which is capable of self cross-linking and/or of reacting with cellulose to increase the degree of stain release from a stained fabric. In addition, the invention can impart other beneficial properties to the fabric, such as reduced creasing and/or wrinkling of the fabric during laundering.

10

15 Detailed Description of the Invention

The invention is based on the treatment of fabric with an amphoteric polymer, which is capable of self cross-linking and/or of reacting with cellulose in the presence of a suitable carrier. The carrier is both textile compatible and substantive to the textile.

20

In the context of the present invention the term "textile compatible carrier" is a component which can assist in the interaction of the amphoteric polymer with the fabric. The carrier can also provide benefits in addition to those provided by the amphoteric polymer e.g. softening, cleaning etc. The carrier may be, for example, a detergent-active compound or a fabric softener or conditioning compound or other suitable detergent or fabric treatment agent.

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If the composition of the invention is to be used in a laundry process as part of a conventional fabric treatment product, such as a detergent composition, the textile-compatible carrier will typically be a detergent-active compound. Whereas, if the fabric treatment product is a rinse conditioner, the textile-compatible carrier will be a fabric softening and/or conditioning compound.

The compositions of the invention may be used at any stage of the laundering process. Preferably, the compositions are used to treat the fabric in the rinse cycle of a laundering process. The rinse cycle preferably follows the treatment of the fabric with a detergent composition.

If the composition of the invention is to be used before, or after, the laundry process it may be in the form of a spray or foaming product.

Carriers having a positive charge, including fabric softeners and/or conditioning agents are particularly preferred as these carries promote the deposition of the polymer at the fabric surface.

The most preferred embodiments of the invention are those where the composition comprises a fabric softening or conditioning composition which itself comprises a quaternary nitrogen group. It is believed that these materials can function as a carrier by forming a complex with the amphoteric polymer.

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The fabrics that may be treated include those which comprise cellulosic fibres, preferably from 1% to 100% cellulosic fibres (more preferably 5% to 100% cellulosic fibres, most preferably 40% to 100%). The fabric may be in the form of a garment, in which case the method of the invention may represent a method of laundering a garment. When the fabric contains less than 100% cellulosic fibres, the balance comprises other fibres or blends of fibres suitable for use in garments such as polyester, for example. Preferably, the cellulosic fibres are of cotton or regenerated cellulose such as viscose.

The laundering processes of the present invention include the large scale and small scale (e.g. domestic) cleaning of fabrics. Preferably, the processes are domestic.

Polymers:

The polymer is amphoteric and therefore comprises both cationic and anionic groups.

The amphoteric polymer preferably comprises numbers of cationic and anionic groups such that the overall charge provided by the cationic and anionic groups is zero or substantially zero. However, the term "amphoteric" as used herein also covers cases in which the polymer comprises both cationic and anionic groups but a slight molar excess (e.g., a 10% molar excess) of one of these groups over the other which causes the polymer to be slightly positively or negatively charged.

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The cationic groups are preferably obtainable by the reaction of an epihalohydrin (such as epichlorohydrin) with amino groups in or on the polymer backbone. The amino groups may, for example, be secondary amino groups which are present in the polyamine which forms part of the polymer backbone. The cationic groups can be azetidinium groups of the following type:



In some embodiments, the polymer comprises two or more isocyanate end groups.

The polymer which is used in the invention is capable of self cross-linking and/or of reacting with cellulose. This ability to self cross-link and/or react with cellulose may be due to the isocyanate groups in the polymer. Additionally or alternatively, the ability to self cross-link and/or be reactive towards cellulose may be due to the presence of other reactive groups in the polymer, including the cationic and anionic groups in the polymer.

Preferably, the polymer has a polymer backbone which comprises at least one polyurethane-urea-polyamine or polyurethane-urea-polyamide chain. The polymer may take any suitable form, including linear, branched or star shaped (but most preferably the polymer is linear). The polymer

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may contain chains other than the polyurethane-urea-
polyamide or polyurethane-urea-polyamine chains, with these
other chains being linked at the end of or within the
polyurethane-urea-polyamide or polyurethane-urea-polyamine
5 chains.

The anionic groups in the polymer are preferably bound to a
nitrogen atom in the polymer backbone by an alkylene chain.
The alkylene chain may be of the formula $(CRR')_n$, where R and
10 R' are the same or different and are hydrogen or lower alkyl
(including C_1 to C_3 unbranched or, for C_3 , branched alkyl)
and n is an integer from 2 to 20, preferably 2 to 10, more
preferably 2 to 5 (such as 3). R and R' may be the same or
different at different carbon atoms along the alkylene
15 chain. Thus, formula $(CRR')_n$ covers, for example, not only
groups such as $(CH_2)(CH_2)(CH_2)$ but also groups such as
 $(CH_2)(CH(CH_3))(CH_2)$. The anionic group is preferably
monovalent. Suitable anionic groups include SO_3^- and CO_2^- .

20 The polymer preferably contains urethane and/or amide and/or
amine linkages which repeat at least twice in the polymer
chain. Polyoxyalkylene polymers may form a part of the
polymer backbone, preferably linked into the polymer by
urethane linkages at their ends e.g., by reaction of a
25 polyoxyalkylene polymer with a di- or poly-isocyanate.
Similarly, polyamine polymers may form a part of the polymer
backbone, preferably linked into the polymer by urea
linkages at their ends e.g., by reaction of the polyamine
with a di- or poly-isocyanate.

- 10 -

- The polymer may be produced by known methods. For example, the polymer may be formed according to the procedure set out in US 3997490, the contents of which are incorporated herein by reference. Thus, the polymer may be obtained by reacting
- 5 an isocyanate-terminated urethane prepolymer, formed from a polyhydroxyl compound (such as a polyoxyalkylene polymer) and an excess of polyisocyanate (such as a diisocyanate), with an excess of a polyamine to form a polyurethane-urea-polyamine. The polyurethane-urea-polyamine thus formed is
- 10 then reacted to introduce the charged (i.e., ionic) groups into the polymer. The polyurethane-urea-polyamine may be reacted with an epihalohydrin (such as epichlorohydrin) to introduce cationic groups into the polymer. The polyurethane-urea-polyamine may be reacted to introduce
- 15 anionic groups into the polymer (before or after introduction of the cationic groups, preferably after introduction of the cationic groups), for example by reaction of the polyurethane-urea-polyamine (optionally containing cationic groups) with 1,3-propanesulphone, 1,4-
- 20 butanesulphone, β -propiolactone, ϵ -caprolactone, δ -valerolactone or a sodium monohalocarboxylate of the formula $X(CH_2)_pCOONa$, wherein X is halogen and p is an integer from 1 to 5. Alternatively or additionally, anionic groups can be introduced into the polymer by reaction of the polyurethane-
- 25 urea-polyamine (optionally containing cationic groups) with acrylonitrile or an acrylate or methacrylate ester and then hydrolysing the product to convert the ester groups to carboxylate groups.
- 30 The isocyanate groups which are preferably contained in the polymers are capable of reacting with water, although the

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rate of this hydrolysis reaction can be slow. Therefore, the compositions of the invention are preferably substantially anhydrous (e.g., by being in solid form or liquids containing non-aqueous solvents) or contain water in
5 a relatively minor amount.

Any isocyanate groups in the polymer may be protected (e.g., by reaction with bisulphite), in order to reduce their susceptibility to hydrolysis. These protected isocyanate
10 groups fall within the meaning of the term "isocyanate groups", as used herein.

The compositions of the invention have the surprising advantage of imparting wear resistance to fabrics, and
15 thereby causing improved surface colour definition of the fabric after laundering, particularly after multiple washings. Furthermore, the polymeric materials contained in the compositions need not cause unacceptable dye transfer and/or stain removal problems.

20

Suitable polymers for use in the invention are available in the form of polymer compositions sold under the trademark ARRISTAN PMD by CHT, Germany.

25 The amphoteric polymer is preferably present in the composition in a sufficient quantity to give an amount of 0.0005% to 5% by weight on the fabric based on the weight of the fabric, more preferably 0.001% to 2% by weight on fabric. The amount of the amphoteric polymer in the
30 composition required to achieve the above % by weight on

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fabric will typically be in the range 0.01% to 35% by weight, preferably 0.1 to 13.5% by weight.

The compositions of the invention, when applied to a fabric,
5 can impart benefits to the fabric when uncured. However, they may be cured by a domestic curing step including ironing and/or domestic tumble drying, preferably tumble drying. The curing is preferably carried out at a temperature in the range of from 50 to 100°C, more
10 preferably from 80 to 100°C.

Carriers:

The nature of the textile compatible carrier present in the
15 compositions of the invention is dictated to a large extent by the stage at which the composition of the invention is used in a laundering process. The compositions are capable of being used, in principle, at any stage of the process.

20 For example, where the compositions are for use as main wash detergent compositions, the one or more textile compatible carriers comprise a detergent active compound. Where the compositions are for use in the rinsing step of a laundering process, the one or more textile compatible carriers may
25 comprise a fabric softening and/or conditioning compound. Use in the rinsing step is a preferred embodiment.

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Detergent Active Compounds

5 If the composition of the present invention is in the form of a detergent composition, the textile-compatible carrier may be chosen from soap and non-soap anionic, cationic, nonionic, amphoteric and zwitterionic detergent active compounds, and mixtures thereof.

10

Many suitable detergent active compounds are available and are fully described in the literature, for example, in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch.

15

The preferred textile-compatible carriers that can be used are soaps and synthetic non-soap anionic and nonionic compounds.

20 Anionic surfactants are well-known to those skilled in the art. Examples include alkylbenzene sulphonates, particularly linear alkylbenzene sulphonates having an alkyl chain length of C_8-C_{15} ; primary and secondary alkylsulphates, particularly C_8-C_{15} primary alkyl sulphates; alkyl ether
25 sulphates; olefin sulphonates; alkyl xylene sulphonates; dialkyl sulphosuccinates; and fatty acid ester sulphonates. Sodium salts are generally preferred.

Nonionic surfactants that may be used include the primary
30 and secondary alcohol ethoxylates, especially the C_8-C_{20} aliphatic alcohols ethoxylated with an average of from 1 to

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20 moles of ethylene oxide per mole of alcohol, and more especially the C₁₀-C₁₅ primary and secondary aliphatic alcohols ethoxylated with an average of from 1 to 10 moles of ethylene oxide per mole of alcohol. Non-ethoxylated
5 nonionic surfactants include alkylpolyglycosides, glycerol monoethers, and polyhydroxyamides (glucamide).

Cationic surfactants that may be used include quaternary ammonium salts of the general formula R₁R₂R₃R₄N⁺ X⁻ wherein
10 the R groups are independently hydrocarbyl chains of C₁-C₁₂ length, typically alkyl, hydroxyalkyl or ethoxylated alkyl groups, and X is a solubilising cation (for example, compounds in which R₁ is a C₈-C₂₂ alkyl group, preferably a C₈-C₁₀ or C₁₂-C₁₄ alkyl group, R₂ is a methyl group, and R₃ and
15 R₄, which may be the same or different, are methyl or hydroxyethyl groups); and cationic esters (for example, choline esters) and pyridinium salts.

The total quantity of detergent surfactant in the
20 composition is suitably from 0.1 to 60 wt% e.g. 0.5-55 wt%, such as 5-50wt%.

Preferably, the quantity of anionic surfactant (when present) is in the range of from 1 to 50% by weight of the
25 total composition. More preferably, the quantity of anionic surfactant is in the range of from 3 to 35% by weight, e.g. 5 to 30% by weight.

Preferably, the quantity of nonionic surfactant when present
30 is in the range of from 2 to 25% by weight, more preferably from 5 to 20% by weight.

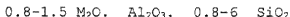
- 15 -

Amphoteric surfactants may also be used, for example amine oxides or betaines.

The compositions may suitably contain from 10 to 70%,
5 preferably from 15 to 70% by weight, of detergency builder. Preferably, the quantity of builder is in the range of from 15 to 50% by weight.

The detergent composition may contain as builder a
10 crystalline aluminosilicate, preferably an alkali metal aluminosilicate, more preferably a sodium aluminosilicate.

The aluminosilicate may generally be incorporated in amounts
of from 10 to 70% by weight (anhydrous basis), preferably
15 from 25 to 50%. Aluminosilicates are materials having the general formula:



20 where M is a monovalent cation, preferably sodium. These materials contain some bound water and are required to have a calcium ion exchange capacity of at least 50 mg CaO/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO_2 units in the formula above. They can be prepared readily by
25 reaction between sodium silicate and sodium aluminate, as amply described in the literature.

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Fabric Softening and/or Conditioner Compounds

If the composition of the present invention is in the form of a fabric conditioner composition, the textile-compatible carrier will be a fabric softening and/or conditioning compound (hereinafter referred to as "fabric softening compound"), which may be a cationic or nonionic compound.

These types of composition are a preferred embodiment of the invention.

The softening and/or conditioning compounds may be water insoluble quaternary ammonium compounds. The compounds may be present in amounts of up to 8% by weight (based on the total amount of the composition) in which case the compositions are considered dilute, or at levels from 8% to about 50% by weight, in which case the compositions are considered concentrates.

Compositions suitable for delivery during the rinse cycle may also be delivered to the fabric in the tumble dryer if used in a suitable form. Thus, another product form is a composition (for example, a paste) suitable for coating onto, and delivery from, a substrate e.g. a flexible sheet or sponge or a suitable dispenser during a tumble dryer cycle.

Suitable cationic fabric softening compounds are substantially water-insoluble quaternary ammonium materials comprising a single alkyl or alkenyl long chain having an average chain length greater than or equal to C_{20} or, more

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preferably, compounds comprising a polar head group and two alkyl or alkenyl chains having an average chain length greater than or equal to C_{14} . Preferably the fabric softening compounds have two long chain alkyl or alkenyl chains each having an average chain length greater than or equal to C_{16} . Most preferably at least 50% of the long chain alkyl or alkenyl groups have a chain length of C_{18} or above. It is preferred if the long chain alkyl or alkenyl groups of the fabric softening compound are predominantly linear.

Quaternary ammonium compounds having two long-chain aliphatic groups, for example, distearyldimethyl ammonium chloride and di(hardened tallow alkyl) dimethyl ammonium chloride, are widely used in commercially available rinse conditioner compositions. Other examples of these cationic compounds are to be found in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch. Any of the conventional types of such compounds may be used in the compositions of the present invention.

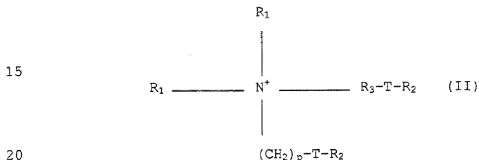
The fabric softening compounds are preferably compounds that provide excellent softening, and are characterised by a chain melting $L\beta$ to $L\alpha$ transition temperature greater than 25°C , preferably greater than 35°C , most preferably greater than 45°C . This $L\beta$ to $L\alpha$ transition can be measured by DSC as defined in "Handbook of Lipid Bilayers", D Marsh, CRC Press, Boca Raton, Florida, 1990 (pages 137 and 337).

Substantially water-insoluble fabric softening compounds are defined as fabric softening compounds having a solubility of less than 1×10^{-3} wt % in demineralised water at 20°C .

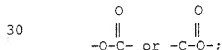
- 18 -

Preferably the fabric softening compounds have a solubility of less than 1×10^{-4} wt%, more preferably less than 1×10^{-5} to 1×10^{-6} wt%.

- 5 Especially preferred are cationic fabric softening compounds that are water-insoluble quaternary ammonium materials having two C_{12-22} alkyl or alkenyl groups connected to the molecule via at least one ester link, preferably two ester links. An especially preferred ester-linked quaternary
10 ammonium material can be represented by the formula II:



- wherein each R_1 group is independently selected from C_{1-4} alkyl or hydroxyalkyl groups or C_{2-4} alkenyl groups; each R_2
25 group is independently selected from C_{8-28} alkyl or alkenyl groups; and wherein R_3 is a linear or branched alkylene group of 1 to 5 carbon atoms, T is

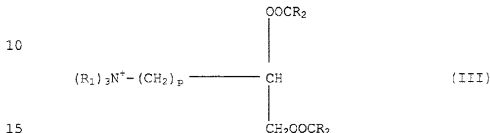


- and p is 0 or is an integer from 1 to 5.
35

- 19 -

Di(tallowoxyloxyethyl) dimethyl ammonium chloride and/or its hardened tallow analogue is especially preferred of the compounds of formula (II).

- 5 A second preferred type of quaternary ammonium material can be represented by the formula (III):



wherein R_1 , p and R_2 are as defined above.

- It is advantageous if the quaternary ammonium material is
20 biologically biodegradable.

- Preferred materials of this class such as 1,2-bis(hardened
tallowoyloxy)-3-trimethylammonium propane chloride and their
methods of preparation are, for example, described in
25 US 4 137 180 (Lever Brothers Co). Preferably these
materials comprise small amounts of the corresponding
monoester as described in US 4 137 180, for example,
1-hardened tallowoyloxy-2-hydroxy-3-trimethylammonium
propane chloride.

- 30 Other useful cationic softening agents are alkyl pyridinium
salts and substituted imidazoline species. Also useful are
primary, secondary and tertiary amines and the condensation
products of fatty acids with alkylpolyamines.

- 20 -

The compositions may alternatively or additionally contain water-soluble cationic fabric softeners, as described in GB 2 039 556B (Unilever).

- 5 The compositions may comprise a cationic fabric softening compound and an oil, for example as disclosed in EP-A-0829531.

- The compositions may alternatively or additionally contain
10 nonionic fabric softening agents such as lanolin and derivatives thereof.

Lecithins are also suitable softening compounds.

- 15 Nonionic softeners include L β phase forming sugar esters (as described in M Hato et al Langmuir 12, 1659, 1666, (1996)) and related materials such as glycerol monostearate or sorbitan esters. Often these materials are used in conjunction with cationic materials to assist deposition
20 (see, for example, GB 2 202 244). Silicones are used in a similar way as a co-softener with a cationic softener in rinse treatments (see, for example, GB 1 549 180).

- The compositions may also suitably contain a nonionic
25 stabilising agent. Suitable nonionic stabilising agents are linear C₈ to C₂₂ alcohols alkoxyated with 10 to 20 moles of alkylene oxide, C₁₀ to C₂₀ alcohols, or mixtures thereof.

- Advantageously the nonionic stabilising agent is a linear C₈
30 to C₂₂ alcohol alkoxyated with 10 to 20 moles of alkylene oxide. Preferably, the level of nonionic stabiliser is

- 21 -

within the range from 0.1 to 10% by weight, more preferably from 0.5 to 5% by weight, most preferably from 1 to 4% by weight. The mole ratio of the quaternary ammonium compound and/or other cationic softening agent to the nonionic stabilising agent is suitably within the range from 40:1 to about 1:1, preferably within the range from 18:1 to about 3:1.

The composition can also contain fatty acids, for example C₈ to C₂₄ alkyl or alkenyl monocarboxylic acids or polymers thereof. Preferably saturated fatty acids are used, in particular, hardened tallow C₁₆ to C₁₈ fatty acids. Preferably the fatty acid is non-saponified, more preferably the fatty acid is free, for example oleic acid, lauric acid or tallow fatty acid. The level of fatty acid material is preferably more than 0.1% by weight, more preferably more than 0.2% by weight. Concentrated compositions may comprise from 0.5 to 20% by weight of fatty acid, more preferably 1% to 10% by weight. The weight ratio of quaternary ammonium material or other cationic softening agent to fatty acid material is preferably from 10:1 to 1:10.

The fabric conditioning compositions may include silicones, such as predominately linear polydialkylsiloxanes, e.g. polydimethylsiloxanes or aminosilicones containing amine-functionalised side chains; soil release polymers such as block copolymers of polyethylene oxide and terephthalate; amphoteric surfactants; smectite type inorganic clays; zwitterionic quaternary ammonium compounds; and nonionic surfactants.

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The fabric conditioning compositions may also include an agent which produces a pearlescent appearance, e.g. an organic pearlising compound such as ethylene glycol distearate, or inorganic pearlising pigments such as microfine mica or titanium dioxide (TiO_2) coated mica.

The fabric conditioning compositions may be in the form of emulsions or emulsion precursors thereof.

- 10 Other optional ingredients include emulsifiers, electrolytes (for example, sodium chloride or calcium chloride) preferably in the range from 0.01 to 5% by weight, pH buffering agents, and perfumes (preferably from 0.1 to 5% by weight).

- 15 The compositions of the invention preferably comprise a perfume, such as of the type which is conventionally used in fabric care compositions. The compositions may be packaged and labelled for use in a domestic laundering process.

- 20 Further optional ingredients include non-aqueous solvents, perfume carriers, fluorescers, colourants, hydrotropes, antifoaming agents, antiredeposition agents, enzymes, optical brightening agents, opacifiers, dye transfer inhibitors, anti-shrinking agents, anti-wrinkle agents, 25 anti-spotting agents, germicides, fungicides, anti-oxidants, UV absorbers (sunscreens), heavy metal sequestrants, chlorine scavengers, dye fixatives, anti-corrosion agents, drape imparting agents, antistatic agents and ironing aids.
- 30 This list is not intended to be exhaustive.

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Fabric Treatment Products

The composition of the invention may be in the form of a liquid, solid (e.g. powder or tablet), a gel or paste, spray, stick or a foam or mousse. Examples including a soaking product, a rinse treatment (e.g. conditioner or finisher) or a mainwash product. The composition may also be applied to a substrate e.g. a flexible sheet or used in a dispenser which can be used in the wash cycle, rinse cycle or during the dryer cycle.

The invention will now be described by way of example only and with reference to the following non-limiting examples.

EXAMPLES

The amphoteric polyurethane polymer used in the examples was ARRISTAN PMDTM (containing 28.8% by weight of the polyurethane polymer), available from CHT, Germany.

All percentages given in the examples are percentages by weight, unless otherwise stated.

Examples 1 and 2

Two products were made by mixing the following compounds:

- 24 -

Example 1: 52.0% Comfort (trade mark, Lever Brothers, UK)
concentrated fabric conditioner
26.8% Arristan PMD™
21.2% Water

5

and

Example 2: 34.5% Comfort (trade mark, Lever Brothers, UK)
concentrated fabric conditioner
34.7% Arristan PMD™
30.8% Water

10

Example 1 was formulated to deliver (theoretically) 0.1%
fabric conditioner actives and 0.1% PMD actives and Example
2 was formulated to deliver 0.1% fabric conditioner actives
and 0.2% PMD actives.

15

Example 3

20

Garment Care

The compositions of Examples 1 and 2, Comfort™ fabric
conditioner and Example 3 (Arristan PMD™ composition alone)
were each applied during the rinse cycle to a load of 600g
white cotton sheeting and 130g of printed woven cotton
washed using 30g Persil Original Non-bio (trade mark) in a
Zanussi Jetsystem 1200 (trade mark) washing machine, 40°C
cotton wash program. Examples 1 and 2 were dosed to deliver
0.2% total actives (Example 1) and 0.3% total actives
(Example 2) i.e., identical levels of fabric conditioner
with varying levels of Arristan PMD™. Arristan PMD™ was

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- 25 -

applied alone at 0.2% actives and Comfort™ fabric conditioner was used at the same level. This was repeated five times for each treatment.

- 5 The colour change on the print was then measured using a Spectroflash™ spectrophotometer. The results are as follows:

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Black printed area:

	ΔL
Untreated	9.17
Comfort TM fabric conditioner	10.11
5 Example 1	6.83
Example 2	6.49
Example 3	7.11

ΔL =change in lightness

- 10 The amphoteric polyurethane reduced the fading of the print, indicating that a higher level of the polymer is being delivered to the fabric when used in conjunction with the fabric conditioner.

15 Example 4

Soil Release/Redeposition

- 1ml of red wine was applied to the fabrics treated as described in the preceding example and left for 7 days. Prior to washing, the colour of the wine stain and the background of the fabric was measured on a SpectroflashTM spectrophotometer. The samples were then washed at 40°C using 110g of Persil Performance BiologicalTM powder. After
25 tumble-drying, the samples were conditioned and then re-measured. The results obtained were:

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Red wine prior to washing:

	ΔL	ΔE
5 Untreated	-17.93	22.10
Comfort™ fabric conditioner	-22.12	26.26
Example 1	-23.83	28.36
Example 2	-22.64	26.99
Example 3	-18.44	22.90

10

ΔE =change in colour

After washing, the colour measurements were:

	ΔL	ΔE
15 Untreated	-3.97	5.94
Comfort™ fabric conditioner	-3.78	5.39
Example 1	-3.63	5.21
Example 2	-3.32	4.83
20 Example 3	-3.18	4.71

In all cases, the fabrics display almost identical stain release properties to normal rinse conditioner. It also appears that including the amphoteric polyurethane actually improves the degree of stain release, possibly by creating a soil-repellent weak anionic layer on the surface of the fabric.

The background of the fabric was compared to pre-wash measurements to evaluate the soil redeposition properties of the treatment. The Spectroflash™ results were:

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 ΔL

	Untreated	-0.20
	Comfort TM fabric conditioner	-0.05
5	Example 1	-0.19
	Example 2	-0.03
	Example 3	0.05

Therefore, there is no evidence of increased soil
10 redeposition by adding the polymer.

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CLAIMS

1. Fabric-care composition comprising one or more textile compatible and substantive carriers and an amphoteric polymer capable of self cross-linking and/or of reacting with cellulose.
2. Composition as claimed in Claim 1, wherein the polymer comprises two or more isocyanate end groups.
3. Composition as claimed in Claim 1 or Claim 2, wherein the polymer has a polymer backbone comprising at least one polyurethane-urea-polyamine or polyurethane-urea-polyamide chain.
4. Composition as claimed in any one of Claims 1 to 3, wherein the polymer comprises cationic groups obtainable by the reaction of an epihalohydrin with amino groups in or on the polymer backbone.
5. Composition as claimed in any one of Claims 1 to 4, wherein the polymer comprises anionic groups bound to a nitrogen atom in the polymer backbone by an alkylene chain.
6. Composition as claimed in Claim 5, wherein the anionic groups are -SO_3^- groups.
7. Composition as claimed in any one of Claims 1 to 6, which further comprises a perfume.

- 30 -

8. Composition as claimed in any one of Claims 1 to 7, wherein the one or more textile compatible carriers comprise a detergent active compound.
- 5 9. Composition as claimed in any one of Claims 1 to 8, wherein the one or more textile compatible carriers comprise a fabric softening and/or conditioning compound.
- 10 10. Composition as claimed in Claim 9, wherein the fabric softening and/or conditioning compound comprises a quaternary ammonium group.
11. A method of treating fabric, as part of a laundering
15 process, which comprises applying to the fabric an amphoteric polymer which is capable of self cross-linking and/or of reacting with cellulose.
12. A method as claimed in Claim 11, wherein the polymer is
20 applied to the fabric in the form of a composition according to any one of Claims 1 to 10.
13. A method as claimed in Claim 11 or Claim 12, wherein the
25 composition is applied to the fabric during washing of the fabric.
14. A method as claimed in Claim 11 or Claim 12, wherein the
composition is applied to the fabric during rinsing of the fabric.

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15. Use of an amphoteric polymer capable of self cross-linking and/or of reacting with cellulose to improve the surface colour definition of fabric after multiple washings.

5

16. Use of an amphoteric polymer capable of self cross-linking and/or of reacting with cellulose to impart pill and/or fuzz resistance to fabric during laundering.

10 17. Use of an amphoteric polymer capable of self cross-linking and/or of reacting with cellulose to increase the degree of stain release from a stained fabric.

15 18. Use as claimed in any one of Claims 15 to 17, wherein the polymer comprises two or more isocyanate end groups.

19. Use as claimed in any one of Claims 15 to 18, wherein the polymer is in the form of a composition according to any one of Claims 1 to 10.

20

20. Use as claimed in any one of Claims 15 to 19, wherein the fabric comprises cellulosic fibres.

INTERNATIONAL SEARCH REPORT

Int. l. Application No
PCT/EP 01/00640

A. CLASSIFICATION OF SUBJECT MATTER

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C11D D06M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98 29530 A (PROCTER & GAMBLE) 9 July 1998 (1998-07-09) cited in the application page 12, paragraph 4 -page 13, paragraph 2; claim 1	1,7-16, 19,20
A	WO 97 31085 A (RHONE POULENC CHIMIE) 28 August 1997 (1997-08-28) claims 1,7,8; example 3	1,4-14, 17,19,20
A	US 4 008 196 A (MATSUDA KAZUO ET AL) 15 February 1977 (1977-02-15) abstract column 5, line 35 - line 41; example 5	1-5
A	WO 96 23761 A (HENKEL KGAA) 8 August 1996 (1996-08-08) page 10, paragraph 3; claim 1	1,8,9, 11,12,14

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FABRIC CARE COMPOSITION

(57) Abstract: Fabric care compositions for application to a fabric comprise a fabric softening and/or conditioning compound and a polymer, which is capable of self cross-linking and/or reacting with cellulose. The polymer is present in the composition in an amount of from 0.002 % to 0.45 %, preferably from 0.005 % to 0.010 % by weight based on the weight of the fabric. The polymers and the compositions may be used to enhance the delivery of perfume to a fabric from a fabric care composition, which comprises a perfume, and/or to enhance the softening of fabric by a fabric care composition, which comprises a fabric softening and/or conditioning compound.

WO 01/63037 A1

- 1 -

FABRIC CARE COMPOSITIONTechnical Field

- 5 This invention relates to fabric care compositions and to the use of polymers contained in the fabric care compositions to treat fabric.

Background and Prior Art

10

The laundry process generally has several benefits for fabric, the most common being to remove dirt and stains from the fabric during the wash cycle and to soften the fabric during the rinse cycle. However, there are numerous
15 disadvantages associated with repeated use of conventional laundry treatment compositions and/or the actual laundry process; one of these being a fairly harsh treatment of fabric in the laundry process.

- 20 Fabrics can be damaged in several ways as a result of repeated laundering and/or wear. Fabric pilling and loss of fabric surface appearance e.g. fuzzing, shrinkage (or expansion), loss of colour from the fabric or running of colour on the fabric (usually termed dye transfer) are some
25 of the common problems associated with repeated laundering. These problems may occur merely from repeated hand washing as well as the more vigorous machine washing process. Furthermore, problems relating to damage of fabric over time through normal use, such as loss of shape and increased
30 likelihood of wrinkling are also significant.

- 2 -

The present invention is directed towards alleviating one or more of the problems referred to hereinabove.

5 Fabric care compositions designed for application to fabric during the rinse cycle of a laundering process generally contain a fabric softening and/or conditioning compound. It is clearly advantageous if the softening effect of the softening and/or conditioning compound can be increased without simply adding more of the compound to the
10 composition.

Fabric care compositions generally contain, in addition to their active ingredients, one or more agents (perfumes) which impart a pleasant smell to the compositions and,
15 often, also to fabric treated with the compositions. It would be an advantage to increase the delivery of perfume to a fabric so as to enhance the smell of the perfume on the treated fabric and/or to enable the amount of perfume in the compositions to be reduced (thereby saving costs).

20 The present invention is also directed to providing one or both of these advantages.

Laundry detergent compositions containing polyamide-
25 polyamine fabric treatment agents are described in WO 98/29530. The compositions are claimed to impart improved overall appearance to fabrics laundered using the detergent compositions, in terms of surface appearance properties such as pill/fuzz reduction and antifading. Laundry compositions
30 containing polyamide-polyamine treatment agents of similar types are taught in WO 97/42287.

- 3 -

WO 96/15309 and WO 96/15310 describe anti-wrinkle compositions which contain a silicone and a film-forming polymer. A wide range of possibilities is given for the film-forming polymer.

5

An industrial process for treating fibres is disclosed in US 3949014. This document describes the use of a polyamine-epichlorohydrin resin in a binder, together with an amphoteric high molecular weight compound having at least 2 cationic groups and at least 2 anionic groups per molecule. US 3949014 mentions the treatment of fabrics with the binder but it is clear that the treatment is intended to be carried out industrially as part of a fabric treatment process rather than as part of a domestic laundering process and this conclusion is supported by the fact that the fabric treated with the binder required curing at a relatively high temperature. Industrial curing of fabrics treated with this type of polymer system is normally carried out at about 150°C.

20

Methods for treating wool with compositions containing an amino functional polymer and a silicone polymer so as to impart shrink resistance are known. However, as described in EP-A-0315477, wool requires a pre-treatment before such compositions can be used. Furthermore, EP-A-0372782 explains that the chemistry of wool is quite different from that of cellulosic fibres such as cotton and the requirements for shrink resistance treatments for cotton are generally very different from those for wool.

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- 4 -

US 4371517 discloses compositions for treating fibrous materials which contain cationic and anionic polymers. In a non-domestic treatment, the compositions increased the rigidity of cotton fabric.

5

Co-emulsifiers, for use in fabric softener and other compositions, which contain cationic quaternary amine polymers, are taught in DD 221922.

- 10 Our related international applications nos PCT/GB99/06429, PCT/GB99/06430 and PCT/GB99/06431 deal with the application of amine- or amide-epichlorohydrin resins to fabric.

- 15 The present invention is based on the surprising finding that certain polymers can be used to treat fabric at very low levels to obtain the benefit of reduced creasing of the fabric. The same polymers, used at low levels or at higher levels, can also unexpectedly enhance the delivery of perfume to a fabric and/or can enhance the softening of a
- 20 fabric by a fabric softening and/or conditioning compound and/or reduce creasing of fabric during laundering.

- 5 -

Definition of the Invention

According to the present invention, there is provided a fabric care composition for application to a fabric comprising a fabric softening and/or conditioning compound and a polymer which is capable of self cross-linking and/or reacting with cellulose, wherein the polymer is present in the composition in an amount of from 0.002% to 0.45% by weight based on the weight of the fabric.

The invention also provides the use of a polymer, which is capable of self cross-linking and/or of reacting with cellulose to enhance the delivery of perfume to a fabric from a fabric care composition, which comprises a perfume.

In another aspect, the invention relates to the use of a polymer, which is capable of self cross-linking, and/or of reacting with cellulose to enhance the softening of fabric by a fabric care composition which comprises a fabric softening and/or conditioning compound.

The invention also provides the use of a polymer which is capable of self cross-linking and/or of reacting with cellulose in a fabric care composition comprising a fabric softening and/or conditioning compound, wherein the polymer is present in the composition in an amount of from 0.002% to 0.45% by weight based on the weight of the fabric, to reduce the creasing of fabric during laundering.

Further provided by the invention in yet another aspect is a method of treating a fabric, as part of a laundering

- 6 -

process, which comprises applying to the fabric a composition of the invention.

Detailed Description of the Invention

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The compositions of the invention comprise a fabric softening and/or conditioning compound and a polymer, which is capable of self cross-linking and/or reacting with cellulose.

10

The polymer may be a nonionic, amphoteric, cationic or anionic polymer, and is preferably amphoteric, cationic or anionic, more preferably cationic. The polymers typically comprise groups, which are capable of reacting with

15

cellulose. Amphoteric polymers, which are suitable for use in the present invention, include the polymers sold under the trademark Arristan PMD by CHT, Germany. Anionic polymers include the carbamoyl sulphonate-terminated poly(ether)urethane resins described in GB-A-2005322, the contents of which are incorporated herein by reference, and available under the trade mark Synthappret BAP from Bayer.

20

Other anionic polymers include Bunté salt-terminated polymers such as those sold under the trademark Nopcolan SHR3 by Henkel. Cationic polymers which are suitable for

25

use in the invention include the resins obtained by the reaction of epichlorohydrin with an amino-terminated poly(oxyalkylene) prepolymer; such resins are available, for example, from Precision Process Textiles (Ambergate, UK) under the trade marks Polymer AM and Polymer MRSM. The most

30

preferred cationic polymers for use in the present invention are amine- or amide-epichlorohydrin (PAE) resins, for

- 7 -

example of the type which are well known for increasing the wet strength of paper.

In the context of the present invention, the amine- or amide-epichlorohydrin resins are polymeric, or at least oligomeric, in nature. Preferably, they have a weight average mean molecular weight of from 300 to 1,000,000 daltons.

The resins of the invention are sometimes referred to below as amine-epichlorohydrin resins and polyamine-epichlorohydrin (PAE) resins (the two terms being used synonymously) although these terms encompass both the amine and amide resins of the invention. The resins may also have a mixture of amine and amide groups.

The amine or amide-epichlorohydrin resins may have one or more functional groups capable of forming azetidinium groups and/or one or more azetidinium functional groups.



Alternatively, or additionally, the resins may have one or more functional groups that contain epoxide groups or derivatives thereof e.g. Kymene 450™ (ex Hercules).

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The resins are available from a number of sources, including from Akzo Nobel under the trademark Kenores 1440™.

Suitable polyamine-epichlorohydrin (PAE) resins include those described in 'Wet Strength Resins and Their Application', pp 16-36, ed. L.L.Chan, Tappi Press, Atlanta, 1994. Suitable PAE resins can be identified by selecting those resins, which impart increased wet strength to paper, after treatment, in a relatively simple test.

Any amine or amide-epichlorohydrin resin having an epoxide functional group or derivative thereof is suitable for use according to the invention.

A particularly preferred class of amine or amide-epichlorohydrin resins for use in the invention are secondary amine or amide-based azetidinium resins, for example, those resins derived from a polyalkylene polyamine e.g. diethylenetriamine (DETA), a polycarboxylic acid e.g. adipic acid or other dicarboxylic acids, and epichlorohydrin. Other polyamines or polyamides can also be advantageously used in the preparation of suitable PAE resins.

Another preferred class of amine-epichlorohydrin resins for use in the invention are those having an epoxide functional group or derivative thereof e.g. chlorohydrin.

The resins may be PDAA-epichlorohydrin resins or PMDAA-epichlorohydrin resins. PDAA is poly(diallylamine) and PMDAA is poly(methyldiallyl(amine)).

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The compositions of the invention may further comprise a silicone component. It is preferred if the silicone component is a dimethylpolysiloxane with amino alkyl groups. It may be used in the context of the present invention as an emulsion in water.

It is preferred if the silicone component is present in a ratio of first component: silicone of from 1:1 to 30:1, preferably 1:1 to 20:1, more preferably 2:1 to 20:1 and most preferably 5:1 to 15:1.

The compositions of the invention preferably comprise a perfume, such as of the type which is conventionally used in fabric care compositions. The compositions may be packaged and labelled for use in a domestic laundering process.

The polymer is present in the compositions of the invention in an amount of from 0.002% to 0.45% by weight based on the weight of the fabric (owf). Surprisingly, the polymer can impart significant benefits to fabric when used at a level of 0.002% owf or above. Equally surprisingly, some of the beneficial effects of the polymer do not greatly increase when the polymer is used at levels of 0.010% owf or above. Therefore, for some of these benefits, such as enhanced softness of fabric, increased perfume delivery to fabric and reduced creasing of fabric during laundering, it is as effective to use the polymer at a level of 0.010% owf as it is at higher levels and practical considerations dictate that a suitable upper limit for the amount of polymer in the composition is therefore 0.45% owf, preferably 0.020% owf, more preferably 0.010% owf.

- 10 -

Those skilled in the art will be able to determine the actual amount of the polymer in the composition that will be required to deliver the amounts on weight of fabric mentioned hereinabove. Factors determining the amount of polymer in the composition include, for example, whether the composition is a dilute or a concentrated rinse conditioner. For a typical dilute or concentrated rinse conditioner composition, the amount of polymer required to provide 0.002% to 0.010% owf will generally be from about 0.036% to 0.9% by weight based on the weight of the composition. However, it will be appreciated that for other compositions the amount of polymer in the composition may fall outside this range.

It has unexpectedly been found that the polymers which are suitable for use in the compositions of the invention can enhance the delivery of perfume to a fabric from a fabric care composition which comprises a perfume. Thus, by incorporating the polymer into a fabric care composition, which comprises a perfume, the effect of the perfume can be increased and/or the amount of perfume required to give a certain degree of odour can be reduced. Since the enhancement of the delivery of the perfume to the fabric is a property which does not increase greatly if the polymer is used in an amount of greater than 0.010% owf, in this aspect of the invention, the polymer is preferably used in the form of a composition of the invention and the composition is also preferably a composition according to the invention. Thus, the polymer is preferably used in an amount of from 0.002% to 0.45% (more preferably 0.005% to 0.020%, most preferably 0.005% to 0.010%) owf and is preferably an amine-

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or amide-epichlorohydrin resin, more preferably a polyaminoamide-epichlorohydrin (PAE) resin.

Surprisingly, the polymers which are suitable for use in the compositions of the invention can also enhance the softening of fabric by a fabric care composition which comprises a fabric softening and/or conditioning compound. Therefore, the softening effect can be increased by incorporating the polymer into a fabric care composition. Alternatively or additionally, the use of the polymer allows the amount of the fabric softening and/or conditioning compound in the compositions to be reduced. In a similar manner to the property of enhanced perfume delivery described above, this property does not increase greatly if the level of the polymer is increased above about 0.010% owf. The composition is thus preferably a composition of the invention in which the polymer is used at a level of from 0.002% to 0.45% (more preferably 0.005% to 0.020%, most preferably 0.005% to 0.010%) owf.

The compositions of the invention, when applied to a fabric can impart benefits to the fabric when uncured. However, they may be cured by a domestic curing step including ironing and/or domestic tumble drying, preferably tumble-drying. The curing is preferably carried out at a temperature in the range of from 50 to 100°C, more preferably from 80 to 100°C.

Preferably, the composition of the invention is a rinse conditioner. However, the composition of the invention may be taking other forms. For example, if the composition of

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the invention is to be used before, or after, the laundry process it may be in the form of a spray or foaming product.

The fabrics which may be treated in the present invention include those which comprise cellulosic fibres, preferably from 1% to 100% cellulosic fibres (more preferably 5% to 100% cellulosic fibres, most preferably 40% to 100%). The fabric may be in the form of a garment, in which case the method of the invention may represent a method of laundering a garment. When the fabric contains less than 100% cellulosic fibres, the balance comprises other fibres or blends of fibres suitable for use in garments such as polyester, for example. Preferably, the cellulosic fibres are of cotton or regenerated cellulose such as viscose.

The laundering processes of the present invention include the large scale and small scale (eg domestic) cleaning of fabrics. Preferably, the processes are domestic.

In the invention, the composition of the invention may be used at any stage of the laundering process. Preferably, the composition is used to treat the fabric in the rinse cycle of a laundering process. The rinse cycle preferably follows the treatment of the fabric with a detergent composition.

The composition of the present invention comprises a fabric softening and/or conditioning compound (hereinafter also referred to as "fabric softening compound"), which may be a cationic or nonionic compound. Preferably, the fabric

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softening compound is a quaternary ammonium compound or a sugar ester.

5 The softening and/or conditioning compounds may be water insoluble quaternary ammonium compounds. The compounds may be present in amounts of up to 8% by weight (based on the total amount of the composition) in which case the compositions are considered dilute, or at levels from 8% to about 50% by weight, in which case the compositions are
10 considered concentrates.

Compositions suitable for delivery during the rinse cycle may also be delivered to the fabric in the tumble dryer if used in a suitable form. Thus, another product form is a
15 composition (for example, a paste) suitable for coating onto, and delivery from, a substrate e.g. a flexible sheet or sponge or a suitable dispenser during a tumble dryer cycle.

20 Suitable cationic fabric softening compounds are substantially water-insoluble quaternary ammonium materials comprising a single alkyl or alkenyl long chain having an average chain length greater than or equal to C_{20} or, more preferably, compounds comprising a polar head group and two
25 alkyl or alkenyl chains having an average chain length greater than or equal to C_{14} . Preferably the fabric softening compounds have two long chain alkyl or alkenyl chains each having an average chain length greater than or equal to C_{16} . Most preferably at least 50% of the long chain
30 alkyl or alkenyl groups have a chain length of C_{18} or above.

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It is preferred if the long chain alkyl or alkenyl groups of the fabric softening compound are predominantly linear.

Quaternary ammonium compounds having two long-chain aliphatic groups, for example, distearyldimethyl ammonium chloride and di(hardened tallow alkyl) dimethyl ammonium chloride, are widely used in commercially available rinse conditioner compositions. Other examples of these cationic compounds are to be found in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch. Any of the conventional types of such compounds may be used in the compositions of the present invention.

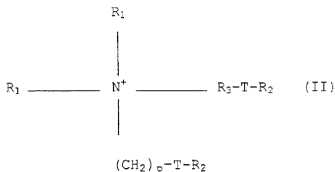
The fabric softening compounds are preferably compounds that provide excellent softening, and are characterised by a chain melting $L\beta$ to $L\alpha$ transition temperature greater than 25°C , preferably greater than 35°C , most preferably greater than 45°C . This $L\beta$ to $L\alpha$ transition can be measured by DSC as defined in "Handbook of Lipid Bilayers", D Marsh, CRC Press, Boca Raton, Florida, 1990 (pages 137 and 337).

Substantially water-insoluble fabric softening compounds are defined as fabric softening compounds having a solubility of less than 1×10^{-3} wt % in demineralised water at 20°C . Preferably the fabric softening compounds have a solubility of less than 1×10^{-4} wt%, more preferably less than 1×10^{-5} to 1×10^{-6} wt%.

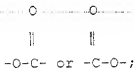
Especially preferred are cationic fabric softening compounds that are water-insoluble quaternary ammonium materials having two C_{12-22} alkyl or alkenyl groups connected to the

- 15 -

molecule via at least one ester link, preferably two ester links. An especially preferred ester-linked quaternary ammonium material can be represented by the formula II:



wherein each R_1 group is independently selected from C_{1-4} alkyl or hydroxyalkyl groups or C_{2-4} alkenyl groups; each R_2 group is independently selected from C_{8-28} alkyl or alkenyl groups; and wherein R_3 is a linear or branched alkylene group of 1 to 5 carbon atoms, T is

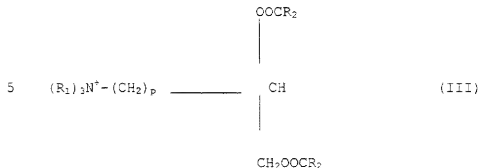


and p is 0 or is an integer from 1 to 5.

Di(tallowoxyloxyethyl) dimethyl ammonium chloride and/or its hardened tallow analogue is especially preferred of the compounds of formula (II).

A second preferred type of quaternary ammonium material can be represented by the formula (III):

- 16 -



10 wherein R_1 , p and R_2 are as defined above.

It is advantageous if the quaternary ammonium material is biologically biodegradable.

15 Preferred materials of this class such as 1,2-bis(hardened tallowoyloxy)-3-trimethylammonium propane chloride and their methods of preparation are, for example, described in US 4137180 (Lever Brothers Co). Preferably these materials comprise small amounts of the corresponding monoester as
 20 described in US 4137180, for example, 1-hardened tallowoyloxy-2-hydroxy-3-trimethylammonium propane chloride.

Other useful cationic softening agents are alkyl pyridinium salts and substituted imidazoline species. Also useful are
 25 primary, secondary and tertiary amines and the condensation products of fatty acids with alkylpolyamines.

The compositions may alternatively or additionally contain water-soluble cationic fabric softeners, as described in GB
 30 2039556B (Unilever).

- 17 -

The compositions may comprise a cationic fabric softening compound and an oil, for example as disclosed in EP-A-0829531.

- 5 The compositions may alternatively or additionally contain nonionic fabric softening agents such as lanolin and derivatives thereof.

Lecithins are also suitable softening compounds.

10

Nonionic softeners include L β phase forming sugar esters (as described in M Hato et al Langmuir 12, 1659, 1666, (1996)) and related materials such as glycerol monostearate or sorbitan esters. Often these materials are used in
15 conjunction with cationic materials to assist deposition (see, for example, GB 2 202 244). Silicones are used in a similar way as a co-softener with a cationic softener in rinse treatments (see, for example, GB 1 549 180).

- 20 The compositions may also suitably contain a nonionic stabilising agent. Suitable nonionic stabilising agents are linear C₈ to C₂₂ alcohols alkoxylated with 10 to 20 moles of alkylene oxide, C₁₀ to C₂₀ alcohols, or mixtures thereof.

- 25 Advantageously the nonionic stabilising agent is a linear C₈ to C₂₂ alcohol alkoxylated with 10 to 20 moles of alkylene oxide. Preferably, the level of nonionic stabiliser is within the range from 0.1 to 10% by weight, more preferably from 0.5 to 5% by weight, most preferably from 1 to 4% by
30 weight. The mole ratio of the quaternary ammonium compound and/or other cationic softening agent to the nonionic

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stabilising agent is suitably within the range from 40:1 to about 1:1, preferably within the range from 18:1 to about 3:1.

- 5 The composition can also contain fatty acids, for example C_6 to C_{24} alkyl or alkenyl monocarboxylic acids or polymers thereof. Preferably saturated fatty acids are used, in particular, hardened tallow C_{16} to C_{18} fatty acids. Preferably the fatty acid is non-saponified, more preferably
- 10 the fatty acid is free, for example oleic acid, lauric acid or tallow fatty acid. The level of fatty acid material is preferably more than 0.1% by weight, more preferably more than 0.2% by weight. Concentrated compositions may comprise from 0.5 to 20% by weight of fatty acid, more preferably 1%
- 15 to 10% by weight. The weight ratio of quaternary ammonium material or other cationic softening agent to fatty acid material is preferably from 10:1 to 1:10.

- The fabric conditioning compositions may include silicones,
- 20 such as predominately linear polydialkylsiloxanes, e.g. polydimethylsiloxanes or aminosilicones containing amine-functionalised side chains; soil release polymers such as block copolymers of polyethylene oxide and terephthalate; amphoteric surfactants; smectite type inorganic clays;
- 25 zwitterionic quaternary ammonium compounds; and nonionic surfactants.

- The fabric conditioning compositions may also include an agent, which produces a pearlescent appearance, e.g. an
- 30 organic pearlising compound such as ethylene glycol

- 19 -

distearate, or inorganic pearlescing pigments such as microfine mica or titanium dioxide (TiO_2) coated mica.

The fabric conditioning compositions may be in the form of
5 emulsions or emulsion precursors thereof.

Other optional ingredients include emulsifiers, electrolytes (for example, sodium chloride or calcium chloride) preferably in the range from 0.01 to 5% by weight, pH
10 buffering agents, and perfumes (preferably from 0.1 to 5% by weight).

Further optional ingredients include non-aqueous solvents, perfume carriers, fluorescers, colourants, hydrotropes,
15 antifoaming agents, antiredeposition agents, enzymes, optical brightening agents, opacifiers, dye transfer inhibitors, anti-shrinking agents, anti-wrinkle agents, anti-spotting agents, germicides, fungicides, anti-oxidants, UV absorbers (sunscreens), heavy metal sequestrants,
20 chlorine scavengers, dye fixatives, anti-corrosion agents, drape imparting agents, antistatic agents and ironing aids. This list is not intended to be exhaustive.

The composition of the invention may be in the form of a
25 liquid, solid (e.g. powder or tablet), a gel or paste, spray, stick or a foam or mousse. Examples including a soaking product, a rinse treatment (e.g. conditioner or finisher) or a mainwash product. The composition may also be applied to a substrate e.g. a flexible sheet or used in a
30 dispenser which can be used in the wash cycle, rinse cycle or during the dryer cycle.

- 20 -

The invention will now be described by way of example only and with reference to the following non-limiting examples.

5

EXAMPLES

The PAE resin used in the examples was Kenores 1440TM obtained from Akzo Nobel (13.5% actives in solution).

- 10 All percentages are percentages by weight unless indicated otherwise.

Examples 1 to 6

- 15 Ten identical washloads were prepared and labelled, each consisting of:

- Ten 40 cm squares of washed off cotton sheeting crease monitors, overlocked and ironed
- 20 • Ten 40 cm squares of washed off cotton interlock crease monitors, overlocked and ironed
- Ten 40 cm squares of washed off viscose crease monitors, overlocked and ironed
- Ten 40 cm squares of washed off 65/35 polyester cotton
- 25 • crease monitors, overlocked and ironed
- Cotton sheeting ballast to make the load up to 2.7kg

- The ten loads were labelled and treated with increasing levels of PAE in combination with a commercially available
- 30 rinse conditioner containing a quaternary ammonium compound

- 21 -

This rinse conditioner comprises about 20 to 25% quaternary ammonium fabric softening and/or conditioning compound(s) and a perfume.

- 5 The loads were subjected to five washes in Whirlpool™ automatic washing machines, having two washes in one machine, and three washes in the second machine. Panelling occurred after the fifth wash. Crease monitors were tumble dried in a commercially available tumble dryer (the washing
10 machines were staggered to allow this) when they were to be panelled (ie after the first and final washes).

Immediately after tumble drying, each load of crease monitors was panelled against AATCC standards.

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Treatments:

Example	Treatment; including, where applicable, amount (% wt) PAE soln in rinse conditioner	Components of treatment composition	% owf PAE
Comparative 1	No rinse treatment	N/A	N/A
Comparative 2	Rinse conditioner	30g Rinse conditioner (RC)	N/A
Comparative 3	Rinse conditioner + 1% PAE soln	30g RC + 0.3g PAE	0.0015
1	Rinse conditioner + 5% PAE soln	30g RC + 1.5g PAE	0.0075
2	Rinse conditioner + 6.67% PAE soln	30g RC + 2g PAE	0.01
3	Rinse conditioner + 10% PAE soln	30g RC + 3g PAE	0.015
4	Rinse conditioner + 20% PAE soln	30g RC + 6g PAE	0.03
5	Rinse conditioner + 50% PAE soln	30g RC + 15g PAE	0.075
6	Rinse conditioner + 100% PAE soln	30g RC + 30g PAE	0.15
Comparative 4	Rinse conditioner + 300% PAE soln	30g RC + 90g PAE	0.45

*The rinse conditioner (RC) used in all cases was the commercially available, concentrated composition described

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The following results were obtained:

i. Creasing

AATCC Crease Standards (higher value = less creased)

5

	Comp Ex 1	Comp Ex 2	Comp Ex 3	Ex 1	Ex 2	Ex 3	Ex 4	Ex 5	Ex 6	Comp Ex 4
AATCC	1.12	1.35	1.16	1.81	1.54	1.61	1.56	1.52	1.61	1.37
95% Error	0.05	0.05	0.1	0.06	0.06	0.08	0.08	0.01	0.1	0.1

- As can be seen from the table of results, after five washes, a significant reduction in creasing is observed for cotton sheeting when PAE is included in the composition at a level of 0.0075% owf and above. Using the AATCC (crease standards) graph, the higher the rating the less creased and the application of PAE gives less creasing in all but the lowest and highest levels. It also appears that applying a much greater amount of PAE does not further reduce the level of creasing. This is surprising as it was not believed that a significant crease reduction was possible at such low levels of PAE, and it was also surprising that applying larger levels does not really reduce creasing further.
- Having noticed the wash loads feeling very soft when PAE was added to the rinse conditioner, some of the interlock samples were folded up to do a softness test. Panellists were asked to put the ten cloths in order from harshest to softest. These were then given a score from 1 to 10 for analysis (1 being harshest, 10 softest).

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ii. Softness (higher indicates more soft)

	Comp Ex 1	Comp Ex 2	Comp Ex 3	Ex 1	Ex 2	Ex 3	Ex 4	Ex 5	Ex 6	Comp Ex 4
Softness Rank	1.1	2.5	3.3	6.4 2	7.5	7.8	5.6	7.9	7.3	5.6
95% Error	0.14	0.53	0.63	1.3 3	0.9 8	0.97	0.93	0.94	1.21	1.16

From the softness data, it can be seen that again from 0.0075% owf PAE and above, the cloths were considered to be softer than Comparative Examples 1 and 2. Again it is surprising that a softness reduction is possible over comparative example 2 at very low PAE levels.

Example 7

Examples 1 to 6 were repeated using the cationic polymer obtainable by the reaction of epichlorohydrin with an amino-terminated poly(oxyalkylene) prepolymer, Polymer AMTM (from Precision Process Textile, Ambergate, UK). Again, a crease reduction was observed after five washes at the low levels of 0.0075% and 0.010% owf.

Example 8

The softness experiment carried out in Examples 1 to 6 was repeated on a washload of terry towelling. Analysis was by paired comparison between samples treated with the commercially available concentrated rinse conditioner described in Examples 1 to 6 alone and those treated with the same rinse conditioner with added PAE.

- 25 -

For rinse conditioner containing 0.0075% owf PAE, 46 out of 48 comparisons chose fabric treated with this composition as more soft.

- 5 By way of comparison, for rinse conditioner containing 0.03% owf PAE, 35 out of 36 comparisons chose fabric treated with this composition as more soft.

Example 9

10

Fabrics treated with the commercially available concentrated rinse conditioner described in Examples 1 to 6 alone and those treated with the same rinse conditioner containing 0.0075% owf PAE and 0.0300% owf, respectively
15 were assessed by a panel of testers for the degree of perfume on the fabric.

20

Twelve 20 x 20 cm squares of washed off terry towelling were treated in a Tergotometer. Six of the replicates were
20 treated with the rinse conditioner alone and the remainder with the rinse conditioner also containing PAE. The conditions were:

- 960cm³ of water added to each pot
- 25 • 1.59g commercially available detergent added and agitate at 75 rpm for 1 minute
- 3 cloths added to each container, then agitated for 12 minutes
- Cloths removed and excess water removed by wringing

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- 960cm³ water, 0.44 g rinse conditioner and required level of PAE (only to 2) added to each pot and agitated for 1 minute
- Cloths added and agitated for 2.5 minutes
- 5 • Cloths removed and spun dry for 30 seconds
- Cloths of a similar treatment tumble dried together
- The cloths were treated and dried five times and panelled after the fifth cycle
- Both rinse conditioner control and rinse conditioner/PAE
- 10 treated cloths were then panelled by trained panel of experts for strength of perfume (on a scale of 0-5, 5 being the strongest).

The results were as follows:

15

Composition of Example No.	Perfume Score
Comparative Example 2	0.55
Example 1	2.01
Example 4	1.90

Surprisingly, the PAE markedly increases the delivery of perfume to the fabric, even at the low level of 0.0075% owf.

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CLAIMS

1. Fabric care composition for application to a fabric comprising a fabric softening and/or conditioning compound
5 and a polymer which is capable of self cross-linking and/or reacting with cellulose, wherein the polymer is present in the composition in an amount of from 0.002% to 0.45% by weight based on the weight of the fabric.
- 10 2. Composition as claimed in Claim 1, wherein the polymer is present in the composition in an amount of from 0.005% to 0.020% by weight based on the weight of the fabric.
3. Composition as claimed in Claim 1, wherein the polymer
15 is present in the composition in an amount of from 0.005% to 0.010% by weight based on the weight of the fabric.
4. Composition as claimed in any one of Claims 1 to 3,
wherein the polymer is an amine- or amide- epichlorohydrin
20 resin.
5. Composition as claimed in Claim 4, wherein the polymer is a polyaminoamide-epichlorohydrin (PAE) resin.
- 25 6. Composition as claimed in any one of Claims 1 to 5, wherein the fabric softening and/or conditioning compound is a quaternary ammonium compound or a sugar ester.
7. Composition as claimed in any one of Claims 1 to 6,
30 which is a rinse conditioner.

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8. Use of a polymer, which is capable of self cross-linking and/or of reacting with cellulose to enhance the delivery of perfume to a fabric from a fabric care composition, which comprises a perfume.

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9. Use as claimed in Claim 8, wherein the polymer is used in an amount of from 0.002% to 0.045% by weight based on the weight of the fabric.

10 10. Use as claimed in Claim 9, wherein the polymer is used in an amount of from 0.005% to 0.020% by weight based on the weight of the fabric.

11 11. Use as claimed in Claim 9, wherein the polymer is used in an amount of from 0.005% to 0.010% by weight based on the weight of the fabric.

12. Use as claimed in any one of Claims 8 to 11, wherein the polymer is an amine- or amide-epichlorohydrin resin.

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13. Use as claimed in Claim 12, wherein the polymer is a polyaminoamide-epichlorohydrin (PAE) resin.

14. Use as claimed in any one of Claims 8 to 13, wherein the fabric care composition is a composition according to any one of Claims 1 to 7, further comprising a perfume.

15. Use of a polymer, which is capable of self cross-linking and/or of reacting with cellulose to enhance the softening of fabric by a fabric care composition, which comprises a fabric softening and/or conditioning compound.

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16. Use as claimed in Claim 15, wherein the polymer is used in an amount of from 0.002% to 0.45% by weight based on the weight of the fabric.

5 17. Use of a polymer which is capable of self cross-linking and/or of reacting with cellulose in a fabric care composition comprising a fabric softening and/or conditioning compound, wherein the polymer is present in the composition in an amount of from 0.002% to 0.45% by weight
10 based on the weight of the fabric, to reduce the creasing of fabric during laundering.

18. Use as claimed in Claim 15 or Claim 17, wherein the polymer is used in an amount of from 0.005% to 0.020% by
15 weight based on the weight of the fabric.

19. Use as claimed in Claim 15 or Claim 17, wherein the polymer is used in an amount of from 0.005% to 0.010% by weight based on the weight of the fabric.

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20. Use as claimed in any one of Claims 15 to 19, wherein the polymer is an amine- or amide-epichlorohydrin resin.

21. Use as claimed in Claim 20, wherein the polymer is a
25 polyaminoamide-epichlorohydrin (PAE) resin.

22. Use as claimed in any one of Claims 15 to 21, wherein the fabric care composition is a composition according to any one of Claims 1 to 7.

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23. Method of treating a fabric, as part of a laundering process, which comprises applying to the fabric a composition according to any one of Claims 1 to 7.

INTERNATIONAL SEARCH REPORT

 International Application No.
 PCT/EP 01/01218

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 D06M15/00 D06M15/55 D06M15/59 C11D3/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 D06M C11D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "Z" document member of the same patent family		
Date of the actual completion of the international search 26 April 2001		Date of mailing of the international search report 07/05/2001
Name and mailing address of the ISA European Patent Office, P.O. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nt, Fax: (+31-70) 340-3016		Authorized officer Koegler-Hoffmann, S

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